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ABSTRACT

The final report of the project that concentrated on the expository language found in content-area textbooks begins with an overview of the project, including rationale, significance, and goals. These goals were to (1) describe how high school students and their teachers used their textbooks, (2) describe and analyze the nature of expository texts, (3) examine the influence of characteristics of expository texts upon different readers' memory for text, (4) determine the influence of various instructional procedures upon students' ability to learn from text, and (5) examine the influence of text manipulations upon the quality of students' learning from text. The remaining sections of the report address the secondary students' use of biology and history textbooks; describe the characteristics of texts, especially through their language; discuss text analytic procedures (validation and criticism); define reader characteristics; examine text-based instructional studies; and discuss text engineering. The summation of the project is provided in the final section. Appendixes include the surveys administered to students in Illinois and Texas; tables relevant to secondary students' use of biology and history textbooks; a complete set of texts, maps, and lists of relationship propositions; examples of scoring and rationale for scoring two free recall protocols; tables relevant to students; recall of text units; individual subjects' ratings of the ease of resolution and the importance of cohesive ties; graphs of predictability ratings of topic continuity; and the importance of rating sentences. (HOD)

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LEARNING FROM EXPOSITORY TEXT: THE INTERACTION OF TEXT STRUCTURE WITH READER CHARACTERISTICS (NIE-G-79-0167)

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I

OVERVIEW OF PROJECT: RATIONALE, SIGNIFICANCE AND GOALS

In a typical school setting, particularly at the secondary level, the language students must deal with the language of exposition, "discourse designed to convey information or explain what is difficult to understand" (Webster's Dictionary). Some characteristics of that discourse is that in comparison to interpersonal language, expository discourse is more formal, more logical, less engaging, less familiar, in short, more difficult. In addition to these surface differences, expository discourse brings with it a functional difference. The student (or general reader/listener) engaged in expository discourse is being invited not only to understand the language presented but also to change his/her existing knowledge about the world. This additional task requirement means that encounters with expository discourse will naturally be effortful and fraught with the possibility of being unsuccessful.

In this project, we concentrated on the expository language found in content-area textbooks. Our general goal was to investigate the nature of naturally-occurring textbook language and to describe how students approach and learn from their textbooks. In surveying the psychological and educational literature on the learning process. we were struck by how little was known about what students, particularly at grades below college level, actually did when encountering their own textbooks within a natural instructional setting. Therefore, we deemed it valuable to study the expository discourse found in secondary level, content-area textbooks and to measure how students approached their textbooks and what they learned from them. We pursued this general goal by means of attacking several interrelated sub-goals that we describe shortly.

Before turning to the specific purposes that guided our investigations, we need to describe some practical features of our study that influenced how we proceeded. First, the project was conducted from two sites: Austin, Texas, and Champaign, Illinois. This division was an unplanned and in some ways unfortunate circumstance in that the benefits of having two investigators involved were mitigated by distance. However, we found that there were numerous benefits as well from the division of labor.

Much of our data reflects the performance of a wider population than would otherwise have existed. Colleagues in different locales contributed different perspectives. In addition, we found that we pursued different extensions at the different sites of the original studies planned. Thus, what began as a four-experiment study ended up as a twelve-experiment project along with the development of an original text analysis tool, a survey questionnaire, and two critical papers on related topics.

Secondly, we began with a relatively strong interest in describing different reader characteristics that might influence how students perform on measures of their textbook learning. Thus, initially we planned to focus much of our description in terms of student characteristics such as gender, course enrolled in and self-evaluation of learning. As the project developed, we found ourselves increasingly focused on describing text features that make a difference in students' responses. Thus, we found that, for example, authors are often indirect in showing the connection between main topics and supporting detail and whenever they are implicit, students as a group find it difficult to learn from the discourse. Also, we generally found that reader characteristics, as we defined and investigated them, did not make an important difference in how we described how students learn from expository discourse.

It is important to add that our shift in focus was a relative one. We never abandoned reader characteristics. Rather, we simply found our interest piqued by what textbook authors seemed to be doing with their prose and our data from text investigations more systematic, reliable and therefore, potentially useful.

In what follows, we describe the specific goals that guided our investigations along with some of the relevant background literature.

The first goal was to describe how high school students and their teachers use their textbooks. The study of how high school students and teachers actually perceive and use their textbooks is important not only as a preliminary to describing texts, but also as a goal in its own right. Recognizing that little is known about the specifics of textbook use, and that out initial contact with students and their teachers could economically yield such information, we decided to pursue a description of the following: (1) methods of study students use when reading their textbooks; (2) aspects of textbooks which make it difficult for students to understand what they read; (3) difficulties students encounter when studying from a textbook; and (4) teacher assistance in the use of textbooks that students find beneficial.

A review of literature dealing with secondary reading suggested that accounts of textbook use in high school classes were largely anecdotal. It was our sense that how students and teachers use and perceive the adequacy of textbooks and instruction in textbook use, as well as the ability to learn from text had been examined to some extent, though not systematically and primarily at the college level.

Our pursuit of this first goal is presented in Section II. Note that it had not figured in our original plans but emerged as we considered our initial contacts with high school teachers and students.

The second goal was to describe and analyze the nature of expository texts. Current literature in the fields of cognitive psychology and linguistics offers a number of systems for analyzing text, for categorizing text characteristics, and for representing learner's memorial representations of text (Crothers, 1972; Frederiksen, 1972, 1975; Meyer, 1975, 1977; Kintsch, 1974, 1977; Kintsch and van Dijk, 1978; Grimes, 1972; Halliday & Hassan, 1976). Many features of these theorics and systems could lend themselves quite well to a description of expository text especially in terms of propostions, interpropositional connectors and cohesive ties. In other words, the systems might describe local, on-line comprehension requirements of exposition. Where we see a lack of development and guidance from the existing literature is in the area of the overall logical pattern of the ideas stated either explicitly or implicitly by an author with the expectation that the reader will learn these ideas. The kinds of structures we seek to describe come closest to what rhetoricians and experts in technical writing have discussed. We contend that expository text involves the presentation of key relationships between concepts and that the nature of a learner's understanding involves in some integral way the representation of these relationships.

Most of the developed systems of text analysis have attempted to provide a general description of extended pieces of text. However, we saw a need for analyses that went beyond propositions, interpropositional connectors, and cohesive ties, and that attempted to represent differentially the structural and logical relationships inherent in expository text. Thus, our second goal was to analyze the characteristics of textbook samples to determine those features that would make the texts easy and difficult to learn. Section III and IV of this report address this goal.

A third goal of the proposed study was to examine the influence of characteristics of expository texts upon different readers' memory for text. By comparing the analyses of text described under Goal 2 with subjects' memory for the same texts, we expected to obtain a clearer understanding of the nature of reader/text interactions across expository selections. We were guided by previous research suggesting that certain aspects of text structure do influence the amount and type of information recalled and that predictions can be made based upon text features as to where inferences such as distortions, omissions, and additions will occur. The greater part of this work has involved the analysis of narrative text. Rumelhart (1975), Kintsch (1976), Thorndyke (1977), Mandler and Johnson (1977), and Chodos and Mosenthal (1978) among others have demonstrated the influences upon recall of a generalized simple story structure that most readers, even rather young ones, possess. Based upon an analysis of a text in terms of the story schema, preditions were made and validated as to where omissions and distortions might occur. With expository text, Meyer and McConkie (1973), Meyer (1975, 1978) and McKoon (1977) have shown the influence of the hierarchy and importance of ideas within text upon recall. Clements (1975) demonstrated the influence of the staging of ideas. Marshall (1976) and Tierney, Bridge and Cera (1979) have demonstrated the influence of the propositional content and interpropositional relationships. In the present investigation the various text characteristics derived from our system of text analysis became the focus of our predictions. The primary discussion relevant to this goal can be found in Section III.3.

A subgoal relevant to examining the influence of text characteristics upon a reader's memory was to consider how certain reader characteristics might act as covariates. The reader characteristics selected were metacognitive ratings, including gender of the subjects and the subjects' field of study (Biology vs. History).

With respect to metacognition, there seemed to be little empirical data on the nature of a reader's metamemory for expository selections except to say that readers often overestimate their level of understanding and are unaware of strategies they might use to cope with difficulties they incur. As Flavell and Wellman (1977) and Brown and Campione (1977) state, students seem remarkably uninformed about their level of understanding, including their strengths and weaknesses as students.

Our interest in examining the relationship of the subjects' gender and field of study to ability to learn from textbook discourse was tied to the popular belief that women students show a definite tendency to avoid and to do poorly in the "hard" sciences (those involving a substantial amount of mathematics) and that very few women enter scientific careers. Certainly, it has been found that women as a group perform more poorly than their make counterparts in science and mathematics while performing better than men in reading (Johnson, 1974). With these findings and beliefs in mind, we were interested in examining the data from two fields of study keeping in mind the subject's sex. To this end, we selected a life science (Biology) and a social science (History) as domains for the pursuit of our study. A discussion relevant to this goal can be found in Section V.

A fourth goal of the present project was to determine the influence of various instructional procedures upon students' ability to learn from text. With this in view, two instructional studies were pursued. A study we conducted with our associates, E.T. Goetz and M.C. Murphy examined the effectiveness of a procedure involving mapping as a study strategy. The technique was based partly on the work of Merritt and his colleagues (Merritt, Prior and Grudgeon, 1977) and developed in conjunction with a team headed by Thomas H. Anderson of the Center for the Study of Reading in Illinois. It incorporates symbols used in other well-known schemes such as Venn diagrams, double-entry tables, outlines, and flow charts. Simply described, the process of mapping a text involves identifying the essence of the message of the author and representing these ideas symbolically to show their complex interrelationship. The system, as a study aid, is meant to summarize visually the overall organization of ideas in text. A second study, by Margolis, examined the effectiveness of a strategy directed at helping students identify and organize topics and subtopics. The topic/subtopic strategy was a two-step procedure designed to enable readers to recognize relationships among key ideas in text. Both the mapping and topic/subtopic strategy were tied directly to the methods of analysis used to identify text characteristics referred to under our second goal.

Taken together, the results of these studies were intended to provide suggestions for how teachers might help students make more profitable use of their testbooks. In particular, based upon the work of Armbruster and Anderson (1979), Geva (1981), Long, Hein, and Coggiola (1978), we hoped to examine the value of study techniques requiring students to address the relationships between ideas. Our attempts are reported in Section VI.

A fifth and final goal was to examine the influence of text manipulations upon the quality of students' learning from text. A corollary to determining the influence of study skills instruction upon students' ability to learn from text is the notion that text manipulations might significantly facilitate students' access to text. Although numerous suggestions have been made for purposes of improving the readability of text, very few of these are based upon a systematic examination of the influence of text characteristics. Fewer still are based upon actual tests of the influence of text manipulations that implement these suggestions. Therefore, the value of most guidelines for writing or revising text are usually unsubstantiated and open to question.

In an effort to offer more informed suggestions, we decided to examine the influence of systematic variation of selected text characteristics. In one study, we varied the use of connectives and the pattern in which ideas were presented in a text form that was distinctive in both science and social science textbooks. In a second study, the notion of an ideal text as contrasted with the real or original text was pursued. Based upon the maps derived from each text, ideal texts were developed and their effect upon recall was compared with that of the real or original texts. From these studies, we did not expect the emergence of precise guidelines for textbook developers. Rather, we hoped to be able to make some broad suggestions for improving the learnability of texts as we advanced research on text engineering. The discussion of our attempts to meet this final goal appears in Section VII.

Summary of Project Goals

1. To describe how high school students and teachers perceive and use their textbooks.
2. To define the characteristics of expository text language in diverse fields of study.
3. To examine the interaction of text characteristics with reader characteristics as students learn from text.
4. To determine the influence of instructional procedures upon students; ability to learn from text.
5. To determine the influence of text manipulations upon the quality of what students learn from text.

II

SECONDARY STUDENTS' USE OF SOCIAL STUDIES AND BIOLOGY TEXTBOOKS

(with J. LaZansky)

The study of how textbooks are read and previewed by students and their teachers is important not only as a preliminary to describing texts, but also as a goal in its right. This section of the report describes how teachers and students from different parts of the country use and perceive their textbooks. In particular, the perceptions of students and teachers toward the following are described: (a) methods of study students use when reading their textbooks; (b) aspects of textbooks which make it difficult for students to understand what they read; (c) difficulties students encounter when studying from a textbook; (d) teacher assistance as it relates to textbook use.

The major assessment tool was the implementation of a questionnaire. The students were asked to respond to the questionnaire in a self-evaluation mode. The teachers of the students were asked to complete the questionnaire by estimating a typical student's response to each item.

Method

Subjects

Table 2.1 describes the initial samples of students who participated in terms of their teacher, school, subject matter, and number of class sections. Subsequent to this initial sampling, surveys were completed in Massachusetts and other schools in Illinois with very similar results to the ones reported here.

In Texas the survey was administered to three tenth grade Biology classes and two American History classes in the same high school. Two-hundred five Biology students and 71 History students completed the survey. The school serves primarily an upper-middle class section of Austin whose residents include many university professors and other professionals. In addition, 15% to 25% of those students in attendance are from a more rural, less well-off area.

In Illinois the survey was administered to 143 Biology students and 204 History students at four different high schools, each located in a different Central Illinois community but all within a fifty mile radius of the University of Illinois.

TABLE 2.1

Characteristics of Classrooms Surveyed

Illinois

Teacher	School	Subject Matter	Number of Sections
Teacher 1	School A	Biology 1	4
Teacher 2	School B	Biology 1	3
Teacher 3		Advanced Biology	1
Teacher 4	School C		
Teacher 5		American History	3
		Advanced Biology	1
		American History	1
Teacher 6	School D	American History	5

Texas

Teacher 1		10th grade Biology	3
Teacher 2			3
Teacher 3	School E		3
Teacher 4		American History	3
Teacher 5			3

Participating at School A were four sections of Biology 1. Students attending School A are drawn from different ethnic groups of varying socioeconomic status within the Urbana township. Approximately one-third of the students are bused from black communities; the remainder walk from white communities neighboring the University of Illinois, many from households of University faculty and staff.

Participating at School B were three sections of Biology 1, one section of advanced Biology and three sections of American History. Students attending School B are drawn from both a rural and mid-sized town populus. The students are predominantly white and most of their parents are involved in some form of agriculture or light industry within the town.

In the third Illinois high school participating, School C, the survey was administered to one section of Advanced Biology and one section of American History. Students attending School C are drawn from both a rural and small town populus residing within Champaign County. Students are predominantly white, and their parents involved in either local farming or associated with the University.

Of the four Illinois High Schools, School D is located the furthest from the University, in a city approximately 50 miles from Champaign. The survey was administered to five section of American History at School D. Students in attendance represent a wide range of ethnic backgrounds from low to middle socioeconomic households, with parents primarily involved in factory work at the many plants located within the industrial sections of the city.

Instrumentation

The developmental phase of the survey spanned a three-month period, and was a cooperative effort between the Texas and Illinois sites. Throughout, we were concerned about the feasability of asking students and teachers to respond to a survey about textbook use. Thus, we adopted two guidelines in developing the survey:

1. time allotted for data collection should be restricted to one class period; and

2. the instrument should be a self-report measure employing forced choice.

Initial drafts of the survey were composed of a variety of probes as well as a variety of response schemes. However, anticipating a wide range in reading ability both within and across classes, we were led to simplify both the format and the phrasing of the survey considerably. Appendix A presents Form A which was administered to subjects in Texas; Appendix B, Form B which was administered to subjects in Illinois. The reason for different forms will be explained momentarily. Each of the research questions identified earlier became the focus of one subsection of the survey. An attempt was made to address each research question in terms of one main probe that served as the stem of a number of sentences in that subsection. In addition, an appropriate response scale was designed in conjuction with each of the four probes. The sections ran anywhere from 12 to 21 items in length. Table 2.2 lists each of the four probes as they appeared on Form A and Form B of the survey, as well as the number of items and response options associated with each. The two most significant differences between Form A and Form B are: (1) Form A has five response options while Form B has four, and (2) Form A does not include subsection 4 of the survey.

During the final stages of development, teachers of those students participating in the study were given a copy of the survey and asked to evaluate it in terms of the appropriateness of the questions, the comprehensiveness of the items, the clarity of the directions, and general readability. Form A reflects changes made subsequent to recommendations solicited from the six Texas teachers, but prior to those made by the six Illinois teachers. Form B reflects changes made following the recommendations of teachers from Texas as well as Illinois.

The prevailing concern of the teachers related to readability. Several teachers suggested that both directions and items be reworded in order that they more closely approximate high school students' "everyday" usage. In addition, it was recommended by three of the six Illinois teachers that the response scale be

TABLE 2.2

Probes Used in Overview of Survey Forms A & B

Sub-section	Probe	Number of Items	Response Options				
			Form A				
1	When you study a chapter in your textbook, to what extent do you use the following methods of study?	19	never	almost never	sometimes	almost always	always
2	How often do you find a chapter in your textbook difficult to understand because:	13	never	almost never	sometimes	almost never	always
3	When you read a chapter in your textbook, to what extent do you have difficulty with each of the following?	18	a lot of difficulty	some difficulty	ocasional difficulty	rarely any difficulty	never any difficulty
			Form B				
1	When you study a chapter in your textbook, how often do you use the following methods?	17	never	sometimes		almost always	always
2	How often do you find that the following are questions which make your textbook difficult to understand?	12	never a problem	sometimes a problem		almost always a problem	always a problem
3.	When you study a chapter in your textbook, how difficult is it for you to:	18	never difficult	hardly ever difficult		sometimes difficult	very difficult
4.	Listed below are things your teacher may do sometimes with your textbook. Indicate whether you would agree that it is important that your teacher do the following.	21	strongly disagree	disagree		agree	strongly agree

reduced from five to four options. Form B of the survey reflects an attempt to accommodate these recommendations. It had been our concern that the items were either not representative, not comprehensive, or possibly both. Interestingly enough, the teachers seemed more concerned with the abundance of items, and pointed out that since some of the items were too specific in nature, they be combined with one or more of the others to form more global questions.

Procedures

Two weeks prior to the administration of the survey, parental consent forms were distributed and then collected. Only those students receiving the consent of their parents were allowed to participate. As reported in the previous section, the teachers were acquainted with the survey in advance of its administration, but were asked not to share or discuss it with students. On the day of the experimenter's first visit to each classroom the survey data was collected. General introductions, and a brief overview of project goals as they relate to the roles of students and teachers participating in the survey portion of the study as well as Experiments 1 and 2 where appropriate (see Section III) were discussed, after which the students were given copies of the survey and asked to respond to each item as candidly as possible. Aside from the specific written directions preceding each subsection of the survey, students were instructed to answer each question as it applied to the History or Biology textbook in use at that time in their respective classrooms. Administration ran approximately forty minutes per class.

Method of Analysis

As pointed out earlier, not only were the Texas and Illinois populations comparatively different but the textbook surveys administered at each site varied slightly in content and in response format across sites (Form A was completed by subjects in Texas; Form B was completed by subjects in Illinois). These differences, particularly the latter, precluded our combining Texas and Illinois data for purposes of analysis. Thus the analysis procedures were identical for both sets of data;

I. What Strategies Do High School Students Implement When They Study?

Overall trends

- High school students enrolled in social studies and biology classes, use a restricted range of study strategies. Most students rarely implement strategies for dealing with their texts. The most frequent study behaviors reported by students were to memorize portions of the chapter, complete textbook questions and activities, at the same time as they read the chapter through only once, and rarely, if at all, refer to any other source. Other than the textbooks, they relied on classnotes, worksheets, and handouts.
- Students enrolled in Biology versus History enlist the same restricted array of study strategies. However, there are some fluctuations across sites and subject areas. In Texas, History students report they use study strategies more frequently than the counterparts enrolled in Biology. In Illinois, the reverse was found. In both states, there was a tendency, albeit slight, for history students to reread more frequently, use chapter summaries, complete worksheets, try to memorize and to be less likely to complete textbook exercises or use classnotes.
- While female students tended to use more study strategies than their male counterparts, the strategies used by both groups were largely the same. Females were slightly more likely to engage the following behaviors: read the chapters aloud, underline, take notes and solicit the assistance or engage in discussion with other students. Males tended to refer to other sources and to read the chapter summaries.
- If history and biology are considered separately, some interesting sex differences emerge. Males use a wider array of strategies more frequently for dealing with biology text than females; females use a wider array than males for dealing with history.

however, the data were treated as the outcome of two separate investigations. However, since the surveys included substantially similar content, generalizations from findings are discussed across sites.

The following descriptive statistics were computed within but not across Forms A and B: the mean response per items and its corresponding standard deviation, as well as the raw frequency per response per item and its corresponding proportional value. Each statistic was computed for each item first by combining the responses of all respondents, then, by separating the respondents into male and female groups, and finally, by separating respondents into History and Biology groups.

Results

We present results of the survey by discussing in turns each of the four subsections of the survey:

1. What strategies do high school students implement when they study?
2. What aspects of textbooks do high school perceive as contributing to difficulties they experience when attempting to understand what they read?
3. What do high school students perceive to be their strengths and weaknesses relative to textbook learning?
4. With respect to content area teachers, what instructional focus and/or strategies do high school students consider important?
5. What is the teachers' perception of the typical history and biology student's responses to the survey?

Discussion of Result

Texas, Form A (See Table 3A and 3B)*: To what extent to high school students implement strategies when they study? Fourteen of the eighteen strategies are implemented "almost always" or "always" by fewer than 20% of the students; thirteen of the eighteen strategies are implemented "almost never" or "never" by over 50%. Only in the case of item 5 (answer questions and/or complete activities in the chapter), item 6 (attempt to memorize portions of the chapter), and item 7 (read the chapter through only once--without or before engaging in any other activities, e.g., note-taking, outlining, underlining) did slightly more than 30% of the students report that the method was "almost always" or "always" implemented. The most frequently chosen response option per item vacilated between "never", "almost never" and "sometimes".

Do strategies differ in terms of how frequently they are implemented by high school students? The difference between the smallest and largest mean response across items is 1.6407 or 41% of the greatest possible difference. What strategies are used most frequently by high school students? The two largest means, those falling nearer $\bar{X}$=5, are associated with items 5 (answer questions and/or complete activities provided in the chapter) and 7 (read the chapter through only once--without or before engaging in any other activities, e.g., notetaking, outlining, underlining), $\bar{X}$=3.0327 and $\bar{X}$=3.1825 respectively. It should be noted, however, that neither of the two strategies are implemented without fail by any more than 13% of the students.

What strategies are used least frequently by high school students? The two smallest means, those falling nearer $\bar{X}$=1, are associated with items 1 (construct an outline(s) for information in the chapter) and 13 (read the entire chapter or portions of it aloud), $\bar{X}$=1.5418 and $\bar{X}$=1.8242 respectively. More students responded "never" (64%) and fewer students responded "always" to item 1 than to any of the other seventeen. Item 1 also has the smallest standard deviation. With respect to item 13, 54% of the students reported that they "never" read the entire chapter or portions of it aloud. *(These and all subsequent tables for this section appear in Appendix C.)

Illinois, Form B (See Table 4A and 4B): To what extent do high school students implement strategies when they study? With respect to all but one of the strategies, over 62% of the students reported that the method was either "never" used or used "sometimes", the latter the most frequently chosen response option across all seventeen strategies. In one case only, item 6(try to memorize important parts of the chapter), did over 50% of the students report that the method was "almost always" or "always" implemented.

Do strategies differ in terms of how frequently they are used by high school students? The difference between the smallest and largest mean response across items is 1.4323, which is slightly less than half of the greatest possible difference. What strategies are used most frequently by high school students? The two largest means, those falling nearer $\overline{X}=4$, are associated with items 6 (try to memorize important parts of the chapter) and 11 (read the chapter through only once--without doing or before you do any notetaking, outlining, underlining, etc.), $\overline{X}=2.7061$ and $\overline{X}=2.2939$ respectively. More students responded "always" (24%) and fewer students responded "never" (9%) to item 6 than to any of the other sixteen items. As the percentage of students responding "always" was only 24%, it was never the case that more than a quarter of the students indicated that a particular strategy was something they used without fail. With respect to item 11, while 17% reported that they always read the chapter through only once, which is the second highest proportion of responses to the "always" response option, 63% reported that the strategy was used "sometimes" or "never". As may be the case with the 54% who responded similarly to the identical item on Form A, this 63% may include students who either never read the chapter, never read the entire chapter, or read the chapter more than once. In light of responses to item 12 (reread the chapter several times), it seems reasonable to rule out the latter as a likely interpretation. In response to item 18 (See Table 24), the free response item eliciting methods of study which are used but which were not mentioned within the forced choice portion of the survey, 11% of the students reported the use of worksheets, 6.6% the use of classnotes, and 12% the use of pictures provided in the text.

What strategies are used least frequently by high school students? The two smallest means, those falling nearer $\bar{X}=1$, are associated with items 17 (read other books on the topic(s) discussed in the chapter) and 13 (read the entire chapter or parts of it aloud to yourself), $\bar{X}=1.2738$ and $\bar{X}=1.6398$ respectively. More students responded "never" (74%) and fewer students responded "always" (.3%) to item 17 than to any of the other sixteen items. In other words, 258 out of the 347 high school students reported that they never read other books on the topic(s) discussed in chapters in their textbooks; one male reported that he did. It is not surprising that item 17 also has the smallest standard deviation across items in the first subsection of the survey. Item 13 has the smallest mean, with a little over 50% of the students indicating that they never read the entire chapter or portions of it aloud for study purposes.

Trends Within and Across Subject Areas

Texas, Form A (See Table 5A, 5B, and 5C): Do Biology and History high school students differ with respect to the strategies they implement when they study? The largest difference between the mean responses of Biology and History students on any one item is .5422 or 13.5% of the greatest possible difference. This difference occurred in response to item 13 (read the entire chapter or portions of it aloud) History students reporting a more frequent use of the strategy than Biology students. Item 15 (answer questions and/or complete activities provided in the chapter) produced a similar difference, History students again reporting a greater use of he strategy. The difference between the mean responses of Biology and History students decreased to .2% in the case of item 16, where 62% of the Biology students and 84% of the History students reported that they never read other sources on the topic(s) covered in the chapter. The mean of History students exceeded that of Biology students on sixteen of the eighteen items; however this difference never exceeded 13.5% of the greatest possible difference.

Illinois, Form B (See Table 6A, 6B, and 6C): Do Biology and History students differ with respect to the strategies they use when they study? The largest difference between the mean responses of Biology and History students on any one item is .6227, which is 22% or slightly less than one-fourth of the greatest possible difference. This difference occurred in response to item 9 (review all the headings in the chapter before you begin to read the chapter), History students reporting a more frequent use of the strategy than Biology students. Item 10 (read the chapter summary before you begin to read the chapter) produced a difference 14% of the greatest possible difference, Biology students again reporting a greater use of the strategy. The difference between the mean responses of Biology and History students decreased to .3% in the case of item 17, where 74% of the Biology students and 75% of the History students reported that they never read other books on the topic(s) discussed in textbook chapters. While it may appear significant that the mean responses of Biology students exceeded those of History students with respect to eleven of the seventeen strategies, the fact remains that among Biology and History students, 12 of the 17 study strategies are occasionally if ever used by at least 74% of the students. In response to item 18 (see Table 24), 15% of the History students reported the use of worksheets as compared to 4.8% of the Biology students. However, slightly more Biology students reported the use of classnotes than History students, 9.8% and 4.4% respectively. Methods reported by Biology students only include: look up words in the glossary (1.4%); study class assignments(1.4%).

Trends Within and Across Gender

Texas, Form A (See Tables 7A through 7G): Do male and female high school students differ with respect to the strategies they use when they study? The largest difference between the mean responses of males and females on any one item is .3763 which is 12.5% or one-eighth of the greatest possible difference. This difference, occurring in response to item 13 (read the entire chapter or parts of it aloud to yourself), was slightly less than twice as large as the second largest difference which occurred in response to item 3 (underline important ideas in the chapter). The difference diminished to .26% on item 9, where 44% of the males and 43% of the females reported that they never review all the headings given in a chapter before reading the chapter. In addition, for twelve out of the seventeen items, the mean response of females is greater than the mean response of males.

II. What Characteristics of Textbooks Do High School Students Perceive as Contributing to Difficulties They Experience When Attempting to Understand What They Read?

Overall Trends

- High school students identified a variety of characteristics as causing difficulties at least some of the time when they read their textbooks. Those characteristics that students most frequently identified as problematic included that
  (a) important ideas were not clearly pointed out;
  (b) students were expected to know more than they do; and
  (c) not enough examples or clarification of key ideas were provided.

  In conjunction with students' concern for main ideas, several students suggested greater use might be made of bold face print. Also, in terms of free responses both history and biology students complained that their texts were boring. Less frequently, students expressed the following concerns: (a) ideas were not related to what students already knew; (b) vocabulary was difficult to understand; (c) topics were not covered in as much detail as needed; and (d) relationships between important ideas were not pointed out.
- Across subject areas, history textbooks tended to be identified more frequently than biology textbooks as displaying characteristics which were problematic. In both Texas and Illinois, Biology textbooks were critized more than History textbooks for the difficulty level of their vocabulary, the amount of detail provided and the tendency to expect students to know more than they should. In Texas, the students complained that their history textbook was out-of-date. In Illinois, students complained that the important ideas were not clearly pointed out.
- Females suggested that their textbooks exhibited more problems than their male counterparts, though both groups were similar and consistently critical. This difference

between the sexes was more prevalent for biology than history and the major complaints females expressed were for the vocabulary and what students were expected to know.

Discussion of Results

Texas, Form A (See Tables 9A and 9B): Do high school students perceive characteristics of textbooks as contributing to difficulties they experience when attempting to understand what they read? It was never the case that more than 35% of the students reported that a particular textbook characteristic was "almost always" or "always" a problem; ten of the thirteen text characteristics are considered by at least 40% but no more than 66% of the students to be "almost never" or "never" a problem. "Sometimes a problem" was the most frequently chosen response option in the case of eleven of the thirteen items.

What characteristics are cited as frequent problems? The two largest means occurred in response to item 2 (the text does not point out the main ideas) and item 11 (the item does not include a good summary of the chapter), $\overline{X}$=2.7802 and $\overline{X}$=2.9375 respectively. It should be noted, however, that these two means reflect a response of "almost always" or "always" a problem by only 21% of the students in the case of item 2 and 35% of the students in the case of item 11. In addition, responses to item 2 resulted in the smallest standard deviation of the thirteen, while responses to item 11 resulted in the largest.

Are any characteristics "never a problem?" For a greater percentage of the students the textbook characteristics listed tend to be either "sometimes a problem" or "never a problem." The two smallest means, those falling nearer $\overline{X}$=1, occurred in response to item 9 (the text presents irrelevant information which is not related to the purposes for which the text is intended), and item 5 (the text is poorly organized; that is, the text is written in a way which is difficult to follow), $\overline{X}$=2.1927 and $\overline{X}$=2.400 respectively. The characteristic described by item 9 is apparently "never a problem" for 24% of the students; the characteristic described by item 5 "never a problem" for 19% of the students.

Illinois, Form B (See Tables 10A and 10B): Do high school students perceive characteristics of textbooks as contributing to difficulties they experience when attempting to understand what they read? It was never the case that more than 30% of the students reported that a particular textbook characteristic was "almost always a problem" or "always a problem." "Sometimes a problem" was the most frequently chosen response option across eleven of the twelve items; with respect to ten out of the twelve, at least 70% of the students indicated that the characteristic was either "sometimes a problem" or "never a problem." The homogeneity of the responses becomes evident when one considers that the difference between the largest and smallest mean response across items is .5129 or 17% of the greatest possible difference.

What characteristics are cited as frequent problems? The characteristics described by items 2 (the text does not tell you which ideas in the chapter are important; that is, which ideas you should remember) and 9 (the text expects you to know more about what you are reading than you usually do) were perceived by more students to be frequent problems than any of the other textbook characteristics; that is, the mean responses associated with items 2 and 9 were the largest. However, the percentages associated with these items (summing across the "almost always" and "always" response categories) are but 36% and 33% respectively. When asked on item 13 (see Table 24) to describe any other weaknesses of the textbook which were not mentioned in the forced choice protion of the survey, 8.3% of the students reported that the text was boring, 2.3% that either no glossary was provided or a better one was needed, and 1.4% that the chapters are either too long or cover too many topics.

Are any characteristics "never a problem?" As reported above for most students eleven of the characteristics are apparently a problem "sometimes" as opposed to "never," "almost always," or "always." In the case of the remaining characteristic (the text is out-of-date; that is, the text does not discuss current issues), close to 50% of the students reported that it was "never a problem."

Strengths of the textbook described in response to item 13 (see Table 24) included the presence of bold face print reported by 6.6% of the students, and the inclusion of pictures, charts, maps, graphs and/or diagrams, reported by 11% of the students.

Trends Within and Across Subject Areas

Texas, Form A (See Tables 11A, 11B, and 11C): Are some textbook characteristics more frequently a problem in one subject area than in the other? The mean response of Biology students exceeded that of History students on ten out of the thirteen items. The largest difference, however, between the two means on any one item was .4781 or 11.9% of the greatest possible difference. This difference occurred in response to item 1 (the text uses vocabulary which is difficult to understand), the characteristic reportedly less a problem in History than in Biology. A similar difference occurred in response to item 13 (the text goes into more detail than is appropriate for your purposes), 9.22% of the greatest possible difference and the mean of Biology students again exceeding that of History students. The difference between the mean responses of Biology and History students decreased to 2.1% in the case of item 7 (the text does not attempt to relate ideas to what you already know about the topic).

Illinois, Form B (See Tables 12A, 12B, and 12C): Are some textbooks characteristics more frequently a problem in one subject area than in the other? The mean response per item associated with History exceeded that of Biology in eight instances out of the twelve. However, the largest difference between the two means on any one item is .1906 or 6% of the greatest possible difference. This difference occurred in response to item 12 (the text is out-of-date; that is, the text does not discuss current issues), this characteristic was perceived as less of a problem in Biology than in History. Item 1 (the text uses words which are difficult to understand) produced a similar difference, 5% of the greatest possible difference, vocabulary reportedly less a problem in History than in Biology.

The free response item (see Table 24) produced other interesting differences. Bold face print was reported as a strength of the textbook by 13.5% of the Biology students as compared to 1.9% of the History students. Similarly, more Biology students than History students mentioned as a strength the inclusion of pictures, charts, maps, graphs and/or diagrams, 17.3% and 6.2% respectively. In addition, that the textbook defines words clearly was reported by 6.9% of the Biology students only. When asked to describe any other weaknesses of the textbook, 10.3% of the History students as compared to 5.6% of the Biology students reported that the textbook is boring. Weaknesses mentioned by students from only one subject area include: dates reported irrespective of chronological order, reported by 3.4% of the History students; and the inclusion of drawings which are unrealistic, reported by 2.8% of Biology students.

Trends Within and Across Gender

Texas, Form A (See Tables 13A through 13G): Are some textbook characteristics perceived to be more frequently a problem than others by one sex as opposed to the other sex? The mean response of females exceeded that of males on nine of the thirteen items. The largest difference, however, between the mean responses of males and females on any one item is only .3001 or 7.5% of the greatest possible difference between means. This difference occurred in response to item 1 (the text uses vocabulary which is difficult to understand), the mean of females exceeding that of males. A similar difference occurred in response to item 3 (the text expects you to know more about what you are reading than you do); the mean of females again exceeded that of males. The difference decreased to .14% in the case of item 5 (the text is poorly organized; that is, the text is written in a way which is difficult to follow), where 58% of the males and 60% of the females reported the particular textbook characteristic as "almost never" or "never" a problem.

Illinois, Form B (See Tables 14A through 14G): Are some textbook characteristics perceived to be more frequently a problem than other characteristics by one sex as opposed to the other? The mean response of males exceeded that of females in six out of the twelve cases; the reverse was true with respect to the remaining six. The greatest difference between the means of male students and female students on any one item occurred in response to items 9 (the text expects you to know more about what you are reading than you usually do) and 11 (the text spends too much time discussing ideas the teacher does not expect you to know), where males indicated that the former was less frequently a problem and the latter more frequently a problem than did females. The difference in both instances was but 6% of the greatest possible difference.

III. What Do High School Students Perceive to be Their Strengths and Weaknesses Relative to Textbook Learning?

Overall Trends

- Most high school students reported that they encountered some difficulty with the strategies they use for learning from their textbooks. Their major difficulties were with concentrating while reading, remembering what was read, knowing how well the information will be remembered and identifying relationships between ideas. Most students reported encountering a lot less difficulty with the strategies which seem to receive most emphasis in their study skill curriculum. Namely, students report little difficulty interpreting diagrams and graphs, changing rate of reading, notetaking, and outlining.
- The types of difficulties students reported varied only slightly across subject areas and inconsistently across states. In Texas students reported more difficulty employing study strategies in History; in Illinois the reverse was the case.
- The findings related to sex differences were similar to the findings for subject area. Females reported more difficulty with biology than their male counterparts; males reported more difficulty with history.

Discussion of Results

Texas, Form A (See Table 15): Do high school students perceive some study-related goals or strategies as more or less difficult than others to achieve or implement? With the exception of those two strategies associated with items 17 (remembering what you have read a week later) and 18 (concentrating as you read the chapter), no more than 14% of the students responded to a given item by reporting that they experience "a lot of difficulty;" similarly, it was never the case that more than 20% of the students responded to an item with "never any difficulty." "Occasional difficulty" was the most freqently chosen response option to eleven of the eighteen strategies; "rarely any difficulty" the most frequently chosen response option to five of the eighteen. The difference between the largest and smallest mean response is 33% of the greatest possible difference.

What do high school students perceive to be their strengths relative to textbook learning? In response to item 4 (interpreting diagrams, graphs, etc.), item 11 (answering questions or completing activities the teacher has provided), and item 6 (taking notes while you read the chapter) at least 50% of the students reported that they rarely experience any difficulty or never experience any difficulty. The largest means, those falling nearer $\overline{X}=5$, are associated with items 4 and 11, $\overline{X}=3.4338$ and $\overline{X}=3.4630$ respectively. In addition, responses to item 11 resulted in the smallest standard deviation across the eighteen items.

What do high school students perceive to be their weaknesses relative to textbook learning? The two smallest mean responses, those falling nearer a mean response of $\overline{X}=1$, are associated with item 17 (remembering what you have read a week later) and item 18 (concentrating as you read the chapter), $\overline{X}=1.0367$ and $\overline{X}=1.2408$ respectively. In the case of item 17, 68% of the students reported "some difficulty" or "a lot of difficulty;" 48% of the students responded similarly to item 18. The standard deviation associated with the former is one of the three smallest of the eighteen.

Illinois, Form B (See Table 16): Do high school students perceive some study-related goals or strategies as more or less difficult than others to achieve or implement? "Sometimes difficult" was the most frequent response to all but five items, "hardly ever difficult" the most frequent response to four out of the eighteen, and "very difficult" the most frequent response to item 17 only. The difference between the largest and smallest mean response is 1.1959 or 39.8% of the greatest possible difference. Note that the tendency of the distribution to be skewed in any one direction is slight, since in fifteen out of the eighteen cases at least 45% of the students reported that the study goal or strategy was "sometimes difficult" or "very difficult," and in twelve out of the eighteen cases at least 40% of the students reported that the goal or strategy was "hardly ever difficult" or "never difficult."

What do high school students perceive to be their strengths relative to textbook learning? In response to items 4 (understand diagrams, graphs, etc.), 6 (take notes from what you have read in the chapter), 10 (answer questions or complete the activities included in the chapter), 11 (answer the questions or complete the activities the teacher has provided), and 12 (change your reading rate (skimming, previewing, reading slowly) with your purpose for reading and type of material you are reading), over 50% of the students reported that the strategy was either "hardly ever difficult" or "never difficult." The percentage associated with the two strategies perceived to be the least difficult of the eighteen, items 4 and 6, is .69. Note, however, that the largest standard deviation across the eighteen items occurred in the case of item 6.

What do high school students perceive to be their weaknesses relative to textbook learning? In response to thirteen out of the eighteen items, over 50% of the students reported that the goal or strategy was "sometimes difficult" or "very difficult." The strategies or goals associated with items 17 (remember what you have read a week later) and 18 (concentrate as you read the chapter) were apparently perceived to be the most difficult, 42% of the students indicating that remembering what you have read a week later is "very difficult," 27% of the students reporting that concentrating as you read the chapter is also "very difficult." Note that the standard deviation paired with item 17 is one of the two smallest. In response to item 19 (see Table 24), the free response item eliciting a description of difficulties students have when they study, difficulties which were not mentioned within the force choice portion of the survey, 7.8% of the students reported boredom, and .9% reported the lengthiness of the chapters.

Trends Within and Across Subject Areas

Texas, Form A (See Table 17): Are some study goals or strategies perceived to be more difficult to achieve or implement by students in one subject area as opposed to the other? The mean response of History students exceeded that of Biology students on seventeen of the eighteen items; the largest difference, however, between the mean responses associated with any one item is .3532 or 8.8%. This difference occurred in response to item 1 (identifying important ideas in the chapter), the mean of History students exceeding that of Biology students. A similar difference occurred in response to item 10 (answering questions or completing activities the text has provided), the mean of History students again exceeding that of Biology students. The difference decreased to .0110 or 27% of the greatest possible difference in the case of item 16 (remembering what you have read a day later), the only instance out of the eighteen where the mean of Biology students was the larger of the two means.

Illinois, Form B (See Table 18): Are some study goals or strategies perceived to be more difficult to achieve or implement by students in one subject area as opposed to the other? The mean responses of Biology students exceeded that of History students in thirteen instances out of the eighteen. The largest difference, however, between the mean responses associated with any one item is .3512 or 12% of the greatest possible difference. This difference occurred in response to item 3 (understand difficult words), the mean of Biology students the larger of the two. The difference decreased to all but 2% in the case of item 17 (remember what you have read a week later), the mean of History students larger than that of Biology students. As reported above, item 17 is associated with the largest overall mean response. With respect to similarities between subject areas, 85% of the Biology students and 81% of the History students indicated that remembering what you have read a week later is "sometimes difficult" or "very difficult." In response to item 19 (See Table 24), 11.9% of the Biology students as compared to 4.9% of the History students reported as one additional difficulty the fact that the text is boring.

Trends Within and Across Gender

Texas, Form A (See Table 19): Are some study goals or strategies perceived to be more difficult to achieve or implement by one sex as opposed to the other? The mean of males exceeded that of females on sixteen of the eighteen items. The largest difference between the means on any one item is .6471 or 16.1% of the greatest possible difference. This difference occurred in response to item 16 (remembering what you have read a day later), the mean of males exceeding that of females. A similar difference occurred in response to item 18 (concentrating as you read), 36% of the males and 59% of the females reporting either "some difficulty" or "a lot of difficulty." The difference between means decreased to 46% in the case of item 11 (answering questions or completing activities the teacher has provided), 53% of the males and 57% of the females reporting "rarely any difficulty" or "never any difficulty."

Illinois, Form B (See Table 20): Are some study goals or strategies perceived to be more difficult to achieve or implement by one sex as opposed to the other? The mean response of males exceeded that of females in ten instances out of the eighteen. The largest difference between the means on any one item occurred in response to item 9 (recall something you already know that will relate to what you are reading), the mean of females exceeding that of males. This difference is, however, only .2243 or 7.4% of the greatest possible difference. The difference between mean responses became as small as .0019 or 6%, when in response to item 5 (outline the information in the chapter), 48% of the males and 45% of the females selected eigher "hardly ever difficult" or "never difficult," and the remaining 52% of the males and 55% of the females selected either "sometimes difficult" or "very difficult."

IV. With Respect to Content Area Teachers, What Instructional Focus and/or Strategies do High School Students Consider Important?

Overall Trends

- There were large differences in high school students perceptions of the worth of instructional activities associated with the use of textbooks. The instructional activities that students identified as most important for teachers to do were the following: (a) identifying which ideas should be remembered; (b) reviewing the chapters before a test; (c) relating new ideas to ideas the student already knows; (d) teaching students to identify important ideas; (e) providing questions to guide students' reading; (f) explaining difficult vocabulary; (g) using a textbook which is more interesting to read; (h) providing students with time in class to read; (i) discussing information not covered in the chapters; (j) providing an outline or overview of the chapters; and (k) providing students with time in class to get together and discuss ideas. Among the suggestions students deemed as least desirable were the following : (a) use a textbook that is easier to read; (b) spend time teaching study skills; (c) allow students to read a textbook on their own rather than making reading assignments; (d) spend time teaching study skills, and (e) stop using the textbook altogether.
- Across subject areas, there was little variation in student recommendations regarding instructional activities and suggestions. What students identified as important for history classrooms closely corresponded to their suggestions for biology classrooms. Noteworthy, however, was the tendency of biology students to support assigning additional activities to help students understand new ideas. History students supported more time to read the text on their own than their biology counterparts. Also, across their free responses, the most cited suggestion made by students was the inclusion of more films in history class.

- Across male and female students, there were very few differences in terms of the instructional activities they tended to support. That is, what males and females deemed as important was consistent with the activities described for all students.

Discussion of results

Illinois, Form B (See Tables 21A and 21B): Do high school students tend to consider some instructional focuses and/or strategies more important than others? The most frequently chosen response option varied across items more in Subsection IV than in any of the other three subsections. While students "agreed" that an instructional strategy was important to implement in thirteen out of the twenty-one instances and "strongly agreed" in three, they "disagreed" in four instances and "strongly disagreed" in one. Those items for which the most frequently chosen response was either of the latter two categoreis include: item 11 (let me read the text for myself instead of making reading assignments), 16 (spend time teaching reading skills), 17 (spend time teaching study skills), 18 (use a textbook which is easier to read), and 21 (not use the textbook at all). The difference between the largest and smallest mean responses is 1.8734, or 62% of the greatest possible difference between means. The distribution tends to be skewed in the direction of "agreement" as opposed the "disagreement" since with respect to over half of the items at least 60% of the students selected either "agree" or "strongly agree" while no more than 25% selected "disagree" or "strongly disagree."

What instructional focuses and/or strategies do high school students consider important? As implied above, well over half of the strategies are considered important by at least 60% of the students. Examining just response option 4, two particular strategies out of the twenty-one are apparently considered very important; that is, 71% of the students "strongly agreed" with item 2 (go over the chapter in class before a test) and similarly, 69.7% "strongly agreed" with item 3 (tell me which ideas in the Chapter I should remember). In addition, items 2 and 3 are associated with the two smallest standard deviations of the twenty-one. When asked on item 22 (see Table 24) to describe anything else the teacher might do to help students study a chapter in their textbook, anything not otherwise mentioned in the forced choice portion of the survey, 2% of the students suggested the use or more frequent use of quizzes and/or practice tests.

What instructional focuses and/or strategies are not considered important by high school students? Over 50% of the students either "disagreed" or "strongly disagreed" that five of the instructional strategies are important, those associated with items 11 (let me read the text for myself instead of making reading assignments), 16 (spend time teaching reading skills), 17 (spend time teaching study skills), 18 (use a textbook which is easier to read), and 21 (not use the textbook at all). The largest percentage occurred in response to item 21, 84%; however, the standard deviation associated with this item is the largest of the twenty-one.

Trends Within and Across Subject Areas

Illinois, Form B (See Tables 22A and 22B): The mean responses of Biology students exceeded that of History students in eleven out of the twenty-one instances; the mean of History students exceeding that of Biology students in the remaining ten. The largest difference between the two means on any one item occurred in response to item 11 (let me read the text for myself instead of making reading assignments), where 75% of the Biology students as compared to 50% of the History students indicated that the strategy was not important while 25% of the remaining Biology students and 50% of the History students either "agreed" or "strongly agreed" that the strategy was important. This difference amounted to 15% of the greatest possible difference between means. Item 18 (use a textbook which is easier to read) resulted in the smallest difference between means, only 4% of the greatest possible difference. In response to item 22 (see Table 24) suggestions mentioned by students from only one subject area include: show more films, reported by 4.9% of the History students; include field trips, 1.5% of the History students; provide notes, 2.1% of the Biology students; require more lab work and more projects, both reported by 1.4% of the Biology students.

Trends Within and Across Sexes

Illinois, Form B (See Tables 23A through 23D): The mean response of female students exceeded that of male students on fourteen of the twenty-one items. The largest difference between the means on any one item is .2503 or 8% of the greatest possible difference. This difference occurred in response to item 13 (assign additional activities to help me understand the ideas in the chapter), where the mean of females exceeded that of males, 72% of the females and 59% of the males "agreeing" or "strongly agreeing" that assigning additional activities is an important instructional strategy. The smallest difference between means, 57% of the greatest possible difference, occurred on item 1, where 70% of the females and 68% of the males considered it important that teachers spend more time explaining the chapter before students read it.

V. What Are Teachers' Perceptions of the Typical History and Biology Student's Responses to the Survey

Overall Trends

- In general the teachers' perceptions of the students--what students do, recommend and the difficulties which they incur--coincided with the responses obtained from the students themselves. However, some significant exceptions did occur. Teachers overestimated the extent to which students use selected strategies. They failed to identify some text characteristics that the students themselves deemed as impediments to learning. They disagreed with the student's perception of their ability to use selected strategies; and also how students would perceive the worth of selected instructional activities.

Discussion of the Results

For purposes of comparing the teacher's responses with those of the students, the responses of both groups to each survey item were averaged, ranked and correlated. For example, the average across the set of teacher's responses for a single item might be 3.5, for another 2.5, for another 4.0, and so on. By comparing the scores for the items within each subsection a rank order of items was derived. These rankings were then compared with those acquired from the students for the same items. The following discussion describes our comparisons of the rankings for the four subsections of the questionnaire.

Part One of the survey included seventeen items which addressed the frequency with which students made use of selected study skills and resoruces. With very few exceptions, the rankings based upon the teachers responses coincided with those of the students. The strategies which students reported that they used more frequent were identical with those the teachers identified. Also, with only one major exception, the strategies which students infrequently enlisted coincided. The notable exception was that teachers overestimated the extent to which the typical student in either their history or biology class referred to any book other than their textbook.

Part Two of the survey included twelve items intended to assess those text characteristics which students deemed as most problematic. Again, with only a few exceptions, the projections offered by the teachers were consistent with the student's actual responses. The most notable discrepancy was an underestimation by teachers of the concern expressed by students for more examples.

Part Three of the survey included eighteen items addressing students' perception of their own strengths and weaknesses. While most of the teachers' projections coincided with the responses offered by the students, there was a tendency by teachers to overestimate the ability of students to use certain of the study skills to underestimate others. For example, teachers overestimated students' perceptions of their ability to remember what they had read, to prepare for exams and to identify important ideas.

Alternatively, teachers underestimated what students perceived as their ability to adapt reading rate in response to purpose and the difficulty level of the material.

Part Four of the survey was concerned with students' perceptions of how important selected instructional activities were. For most of the activities listed, the teacher's ranked responses agreed with those offered by the students. However, there were several activities where disagreement occurred. For example, teachers did not rank as important as student's did the discussion of information not covered in the chapter. In contrast teachers deemed more worthwhile than did the students the teaching of reading skills, the teaching of study skills and allowing students to read the text on their own rather than making reading assignments.

Final Comment

Results of our survey indicated that content area classrooms or the whole continue to be oriented around the use of a single textbook. This has made success in the content area nearly synonymous with the ability to learn from the one textbook provided. As unfortunate as it may seem, this situation together with the bulk of required reading, the demand for intensive study, and the emphasis upon independent learning, make it imperative that students find a way to penetrate what Hahn (1967) refers to as the "paper curtain." The present survey results provide some suggestion as to why this may be the case. The data suggests that the study techniques students enlist represent a restricted repertiore of goals, strategies and resources. Furthermore, the student's level of facility with these strategies, with the texts themselves and with the instructional environment may act as impediments to learning. While suggestions must be somewhat speculative, given that self-report nature of the data, they represent hypothesis that can be explored in collaboration with more systematic, objective and detailed analysis as texts, readers, and instruction.

III

CHARACTERSTICS OF TEXT

(with S. Ulerick and K. Margolis)

PART I. A METHOD FOR DESCRIBING TEXTBOOK LANGUAGE

Keeping in mind our general goal of gaining insight into how students learn from their textbooks, we faced a major task of describing the language found in textbooks. One parameter we might have used is the ubiquitous readability formula. While the notion of measuring the difficulty of written materials dates back centuries, most studies have depended almost solely on readability formulas (Aukerman, 1972; Klare, 1974-75). As Beldon (1962) noted, the appearance of Gray & Leary's What Makes a Book Readable in 1935 gave impetus to work on adult and upper-school level readability problems, the Lorge, Yoakam, Flesch, and Dale & Chall being among the many readability formulas that emerged.

While readability formulas have been valuable, they have also encouraged a restricted view of what makes a text comprehensible. Their analyses have generally been at a word or sentence level and have failed to address those characteristics of text that extend beyond the sentence or those features such as the author's reason for writing that appear to be implicit but are no less potentially important factors in determining comprehensibility. Furthermore, as Horn (1937) suggested, referring to social studies material, even if materials were written in clear, nontechnical language, the very nature of the concepts would make the material difficult to understand.

For these reasons, we rejected the construct of readability as it has been used and searched for a way of describing content-area textbooks that would capture the unique conceptual demands it makes on readers. We considered how textbooks are used in the classroom. As part of that setting, textbooks are intended to teach students concepts, to have them consider knowledge, systems of information and ways of knowing as veridical transactions with the world. Thus, we needed to describe what it was they were expected to learn. We needed a system that, like the students, would identify the essential information that the textbook's author intended to present in his or her prose. And, although the major clues to the author's intended message are the actual words used, the message is the ideas and relationships between ideas that the author hoped students would learn about the topic presented.

In pursuing our goal of describing the text that students were expected to learn, we considered available text analysis systems. There were several that recommended themselves by virtue of their flexibility in representing discourse and of their respected empirical traditions. For example, the analysis systems of Kintsch (1974; Turner & Greene, 1977; Kintsch & Van Dijk, 1978), Meyer (1975) and Frederiksen (1972, 1975) have been used extensively to describe information texts. All three have the potential of identifying and classifying the "pieces" of a text (bigger than a word, smaller than a sentence, usually identified as a proposition; Fillmore, 1968) as well as describing whole-text patterns of propositions. However, where these systems were most useful in the description of the ongoing process by which as reader takes the print on the page, constructs a meaning for it, and learns the text, we needed a system that would describe what a reader is expected to learn from a text. Although it is theoretically crucial to determine how readers process print, it is also important to focus on the more permanent changes in readers that might occur as they encounter print. Furthermore, instructionally, this is a major goal: to have students not only understand what they read but change their conceptions of the world as a result of their contact with an author's (or teacher's) message.

Thus, we developed relational mapping, a system of text analysis particularly suited to describing the concepts and relationships between concepts that authors intend and that readers should learn when they approach informative discourse in an instructional setting. The system borrows from Armbruster and Anderson (1979) the same limited list of relationship categories and the same graph-symbolic representation of text. The maps we produce as a first step in text description reflect an underlying assumption that the author intended everything stated about a topic to form a coherent whole. From the graphic map, we derive relationship propositions that are then rated for explicitness and embeddedness. These propositions can be used in a number of ways, such as scoring recall protocols, deriving test questions and preparing students to learn from the text.

In the next three sections, we describe in detail the parts and process of relational mapping and its associated problems and promise.

Relational Mapping

The Pieces

There are two major and independently useful products of relational mapping, the map and the list of relationships propositions. The map is a graphic representation of the concepts and relationsips that we as text analysts identify as the intended message of the author. It is constructed by identifying the concepts (ideas, facts, topics) in the text and then graphing (mapping) the relationships that hold the concepts together to form a coherent whole. Concepts are somewhat loosely defined in the system and their scope varies with the level of detail needed for research or instructional purposes. In a very detailed map, for example, concepts may be single adjectives or prepositional phrases related as properties of a superordinate concept. In more general mapping, whole sentences and sometimes, paragraphs or units may serve as concepts. The degree of specification of a map depends upon what it is that the researcher or teacher expects the learner to take away from the text.

Three major assumptions guide the mapping process. The first, alluded to earlier, is that the text forms a coherent discussion of the topic. That is, we make the assumption that everything the author states is somehow relevant and related in some way to the topic. This assumption becomes the basis for inferences we make and for implied concepts and relationships we bring into the map to make all its parts cohere.

The second assumption is that the concepts presented by the author are organized and are subsumed (embedded) by their relationship to the topic of the text. Thus the graphic representation of the text shows by its structure the set membership, property, comparison and process relationships that hold the concepts together. The first and second assumptions work together when we as text analysts find a place in the developing map for every concept presented by the author.

The third assumption is that a relatively limited set of relationship types will be adequate in representing all of the ways in which two concepts can be related to each other in informative discourse. The relationship types come from rhetoric and identify Concept A as defining Concept B, as being a property of Concept B, as being an example of Concept B, as being similar or not similar to Concept B, as being greater than or less than Concept B, as occurring before Concept B, or as causing Concept B. The relationship types as well as the graphic symbols used to represent the relationships are presented in Figure 3.1.

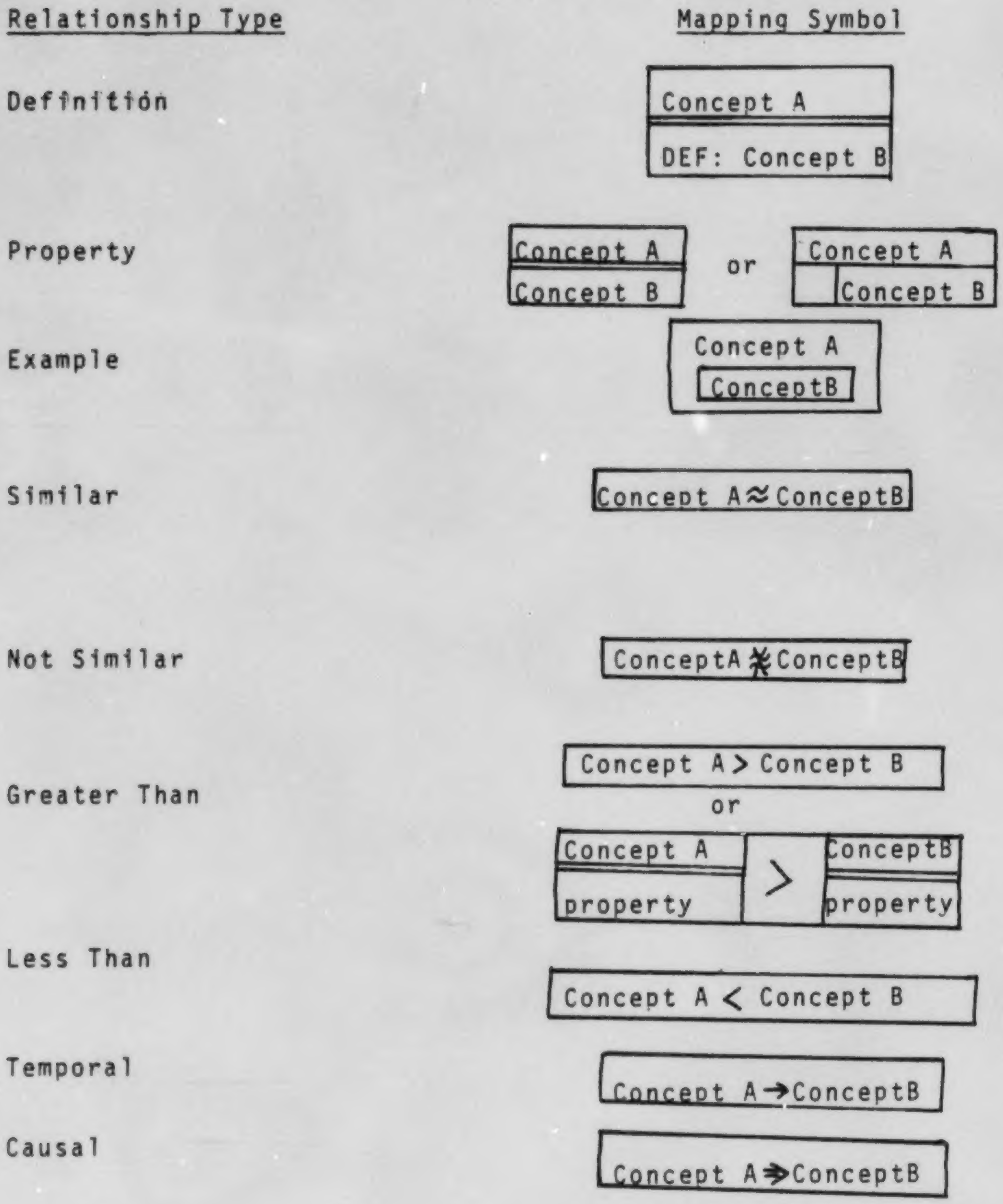
Note that we occasionally group the "similar," "not similar" "greater than," "less than" relationships and call them comparison relationships. Similarly, we refer to the temporal and causal relationships as process relationships since they both indicate the steps in a chain of events (or reasoning). The definition and property relationships are also closely related as giving characteristics of concepts while the example relationship gives set membership information.

The last assumption described above, forces the text analyst to make a certain kind of categorical decision about each potential relationship identified in a text. Any relationship between two concepts must be one of the nine types possible within the system. The three assumptions of mapping working together lead the text analyst to show the structure and embeddedness of ideas within a text in terms of one or more of nine possible relationship types. Thus, Concept A may cause Concept B and that relationship between those two concepts may be a property of an example of the main topic of a text.

Once a map of a text is produced, the list of relationship propositions can be derived. This simply involves making an explicit verbal statement of how Concept A is related to Concept B. Each relationship proposition is then compared to the original text, and a decision is made about how explicit the author was in indicating the concepts and the relationship found in the proposition. Finally, the level of embeddedness of each relationship proposition is determined by counting the number of steps that are needed to connect it back to the main topic of the text. Thus, the relationship propositions yield three products, type of relationship, rated explicitness and level of embeddedness. In the next section, we describe the process by which we arrive at a map of a text and derive its associated list of relationships propositions.

Figure 3.1

Relationship Types Recognized by Relational Mapping


Relationship Type
Mapping Symbol
Definition
Concept A
DEF: Concept B
Property
Concept A
Concept B
or
Concept A
Concept B
Example
Concept A
ConceptB
Similar
Concept A ≈ ConceptB
Not Similar
ConceptA ≉ ConceptB
Greater Than
Concept A > Concept B
or
Concept A
property
>
ConceptB
property
Less Than
Concept A < Concept B
Temporal
Concept A → ConceptB
Causal
Concept A ⇒ ConceptB

The Process

The map. In mapping a text, we begin by reading over the whole passage, keeping in mind the level of detail that the map will need to reflect given our established purpose. The following text, extracted from a high school level biology textbook, will serve to illustrate the process of mapping.

SHARKS, RAYS, AND SKATES

> *Sharks, rays, and skates belong to the class Chondrichthyes. This means "cartilage fishes." It is thought that they developed early in the Devonian period. Of the fishes that lived in the ancient seas, many cartilage fishes have survived relatively unchanged in great numbers.*
>
> *Sharks are similar to true fishes in many ways. But they have certain differences which place them in a separate class. Sharks have placoid scales which have the same origin as the shark's teeth. The mouth is a horizontal slit on the ventral side of the head. The jaws of the shark are very strong and lined with razor-sharp, pointed teeth. The teeth are placed in several rows. When a tooth is lost, another one may move forward to replace it. The teeth slant backward to hold the food securely in the mouth. This, combined with great strength, makes the shark a fearsome hunter.*
>
> *Water enters the mouth, where it passes over the gills on either side of the head. The water is then forced out through separate pairs of gill slits. The gills are the respiratory organs of the fish.*

As the map develops, the three assumptions described above guide the decisions we make in representing the text: 1) the relationship between any two concepts must be one of the nine types recognized by the system; 2) all concepts must be related through embedding to the main topic; and 3) concepts and relationships, even though not mentioned explicitly by the author, must appear in the map if they are needed to make the whole text coherent.

After reading the text, our first task is to identify the main topic of the passage. This is not always an obvious choice. In the passage presented above, there are several possibilities. One is the heading which proclaims that the text will be about "Sharks, rays and skates." The first sentence tells us that these three organisms belong to a superordinate class "Chondrichthyes" and characteristics of the class as a whole are then provided. Perhaps, "Class Chondrichthyes" is the topic. But then, most of the text is a discussion of sharks and perhaps by virtue of the extent of discussion, "sharks" should be considered the topic.

We have found that two guidelines can be used to establish the topic of a text. The first is primacy in the presentation of concepts in the text. As much as possible, in mapping, we try to adhere to the serial order of concepts presented and thus, we often identify an "early" concept as the topic of a text. The second guideline applied in situations where two concepts vie to be chosen as topic but one is the logical superordinate of the other. In such a situation, the superordinate term automatically becomes the topic. One text author claims that sharks, rays, and skates are examples of the class "Choncrichthyes," and thereby makes these concepts subordinate terms. In this case, both guidelines are used since the concept "Class Chondrichthyes" not only represents a superordinate term but also occurs near the beginning of the text.

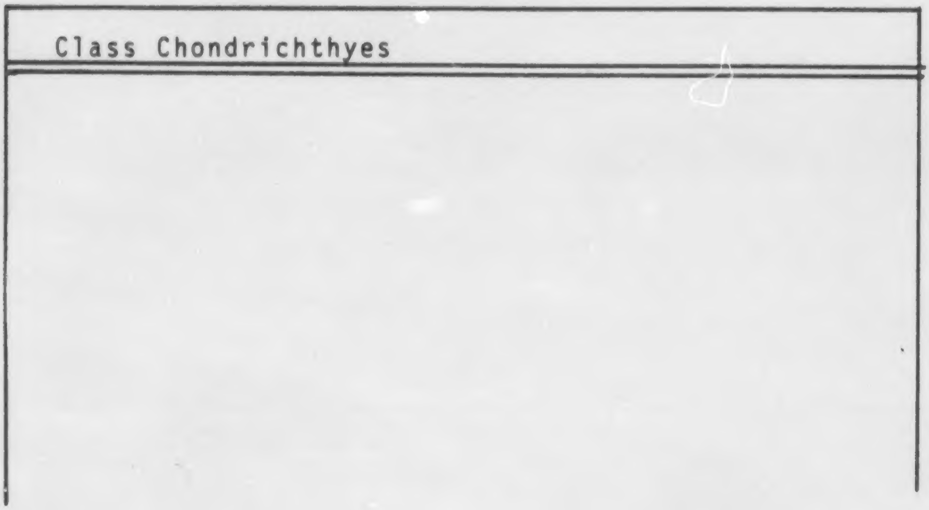
The main topic is represented graphically by writing it on the map, drawing a double line under it, and placing a large, and for the moment, empty box around it (see Figure 3.2). The box will eventually be filled with the concepts presented in the rest of the text, all structurally tied in some fashion to the main topic.

In proceeding through the text, similar decisions are made. What is a concept? How is it related to other concepts? Where does it go on the map? These questions are answered simultaneously with the selection and placement of each succeeding concept. Revisions of the developing map are often necessary. Consider our sample text. In the first paragraph, the author has presented some information about class Chondrichthves as a group of fishes. We want these items placed close to the main topic in the map and subordinate to it. (We ignore for the moment the first sentence.) The author states in the second sentence "this means 'cartilage fishes.'" We make the inference that "this" refers to our main topic and we take the word "means" as a marker for the relationship of definition. As the next concept placed on the map, we write below the double line," DEF: cartilage fishes," and draw a line across the map underneath the definition.

We then proceed to the next sentence to see if it presents concepts

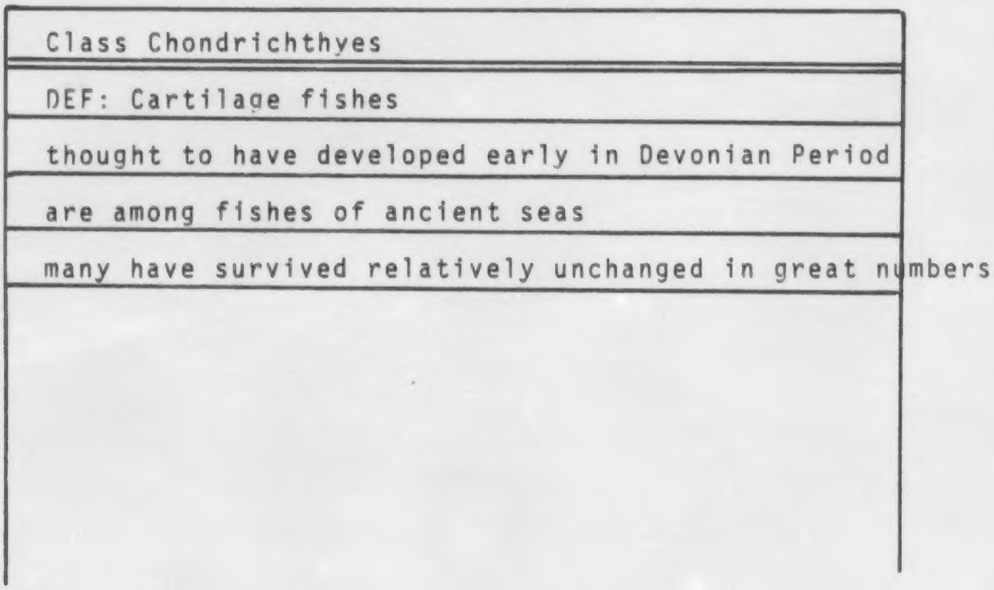
Figure 3.2

Beginning of Map of Sample Text



Class Chondrichthyes

Figure 3.3
Developing Map of Sample Text



Class Chondrichthyes

DEF: Cartilage fishes

thought to have developed early in Devonian Period

are among fishes of ancient seas

many have survived relatively unchanged in great numbers related to the main topic. The sentence describes when the cartilage fishes probably developed. We judge this information to be a property or descriptor of the main topic and perceive it as representing just one instructional concept. Accordingly, the whole sentence is mapped as a property of class Chondrichthyes. Evidently, the author is not willing to state the concept as a fact but qualifies it with "it is thought that." This qualifier may or may not be instructionally important. It may reflect the author as scientist reverting to the careful style meant for other scientists. At this point, we choose to include it in the map but only as part of the same instructional concept it qualifies.

The final sentence of the paragraph is more complex than the preceding ones. Two more properties of cartilage fishes are presented: they lived in ancient seas, and many have survived. The former property is actually a less precise restatement of the information about the Devonian period, although the author is not clear on this equivalence. Since that inference is not essential to understanding the text as a coherent whole, it is not mapped as such. A sophisticated reader might also infer from the property that there were other fishes in ancient seas. This inference is also true, but again, provides a non-essential elaboration of the content. We feel less certain that the author intended for students to derive that meaning. Therefore we leave it out. The map of the text so far would look like Figure 3.3.

The remainder of the passage is concerned solely with sharks and their various characteristics. Sharks are related to the main topic, class Chondrichthyes by "belonging to it," along with rays and skates. Thus we pick up the information from the first sentence and indicate that sharks, rays, and skates are all examples of the class. Examples are mapped as concepts enclosed in boxes within the big box that represents the whole text. "Rays" and "skates" become one-word boxes since the author does not say anything more about them. "Sharks," by contrast, labels a large box to be filled with concepts that are related specifically to sharks. Figure 3.4 depicts the completed map of the sample text.

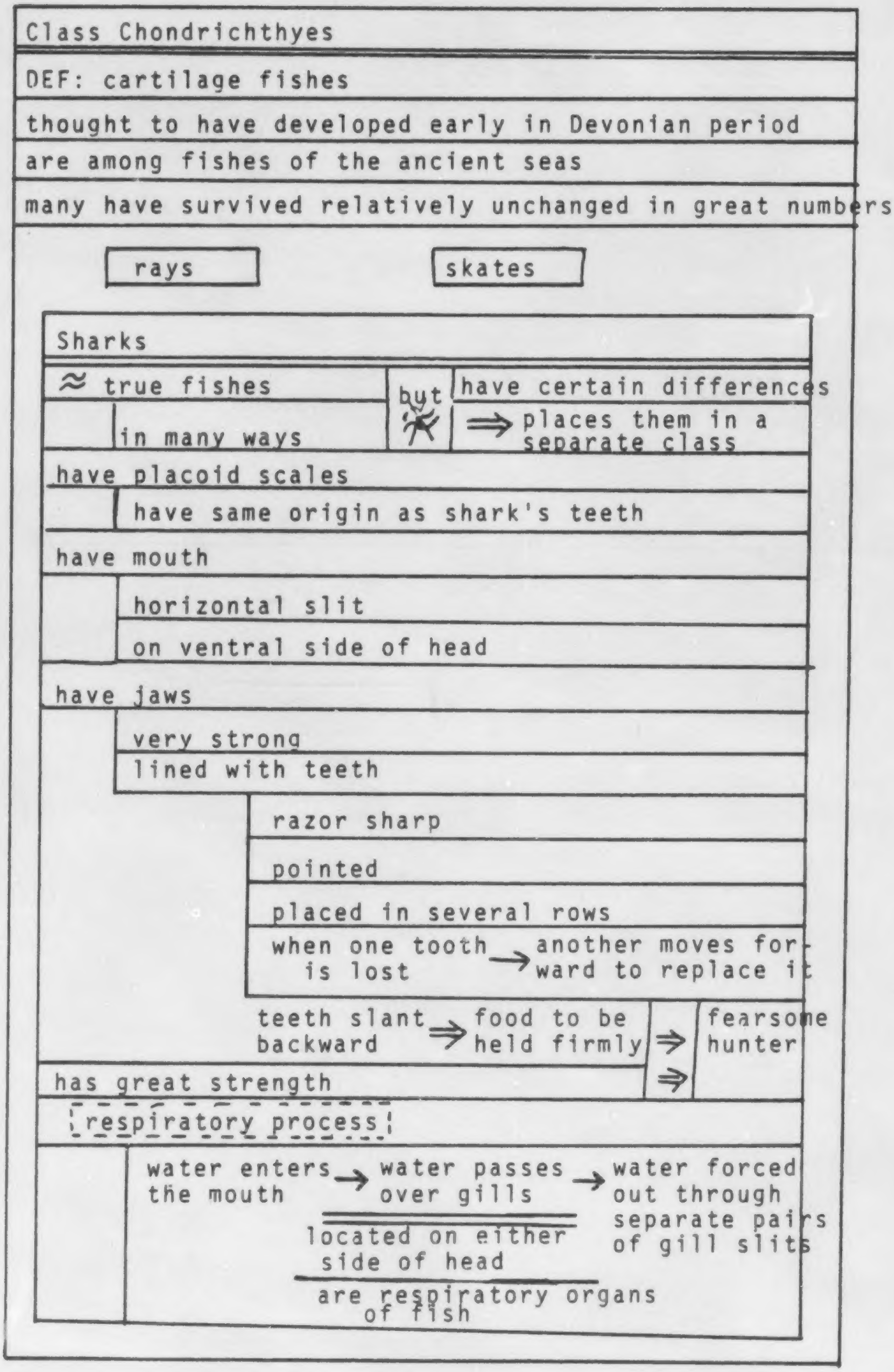
We would like to make a few more comments about sections of the "sharks" box before describing other aspects of relational mapping. Note, first, that not all properties have equivalent embedding. The author has described several properties of sharks: they have scales, a mouth, jaws. For each of these, additional information is given. For instance, the jaws have teeth and the teeth are razor-sharp, pointed and come in several rows. To represent these properties of properties, we indent successively embedded properties to show which concepts are connected.

Toward the end of the second paragraph, the author includes concepts that are related temporally and causally. The temporal relationship is cued by the word "when." It is shown on the map by a single arrow (→) between two concepts. After one tooth is lost, the author informs, another may move forward to take its place. First one event occurs and then the other. This entire relationship is represented as a property of "teeth." Relationships of causality are featured in the remainder of the second paragraph. The slant of the teeth causes food to be held securely and this, in turn, contributes to making the shark a fearsome hunter. Causal relationships are indicated by double arrows (⇒) on the map.

The final paragraph of the text presents a special problem. It begins with the phrase "water enters the mouth." The term "shark" is not used and, in fact, only in the last word of the paragraph do we find any explicit mention of fish. "Mouth" has not been mentioned for several sentences. How then is this section of the text to be related to the rest if we are to assume that the text is coherent? It is in such a situation that essential inferences must be made. In this case several are needed. First, we assume that the paragraph must be giving more information about sharks. This assumption is based on another assumption we make about text that if a major topic change were occurring, the author would have told us. By default, in this case, new information must be continuing the development of a previously introduced topic. Second, we infer that the temporal chain of events describing the flow of water must refer to some feature of property of the shark. The property needed is one that can serve as a superordinate to the process of water circulating over the gills and

Figure 3.4

Final Map of Sample Text


Class Chondrichthyes
DEF: cartilage fishes
thought to have developed early in Devonian period
are among fishes of the ancient seas
many have survived relatively unchanged in great numbers
rays
skates
Sharks
≈ true fishes
in many ways
but
have certain differences
⇒ places them in a separate class
have placoid scales
have same origin as shark's teeth
have mouth
horizontal slit
on ventral side of head
have jaws
very strong
lined with teeth
razor sharp
pointed
placed in several rows
when one tooth is lost → another moves forward to replace it
teeth slant backward ⇒ food to be held firmly
⇒
⇒
fearsome hunter
has great strength
respiratory process
water enters the mouth → water passes over gills → water forced out through separate pairs of gill slits
located on either side of head
are respiratory organs of fish

gill slits of the fish. What that superordinate property might be becomes clearer in the last sentence when the author states "the gills are the respiratory organs of the fish." "Respiratory organs" must play a role in a process and a process label is exactly what we need as a superordinate for this section of the map. Thus we infer that sharks have a respiratory process and we tie the final paragraph to the map through this inferred property of sharks. The dashed lines around the concept "respiratory process" indicate that it is implied rather than explicitly stated in the text.

Thus, we complete our map of the sample text. Two further notes need to be added to explicate some conventions we have found useful. When describing a text at a relatively detailed level, we make it a practice to render on the map any concept of relationship that the author mentions explicitly, even though occasionally, this may marr the ideal structure being developed. Also, we have used the "not similar" symbol (≁) whenever the author states explicitly or implies a contrast relationship by the use of connectors such as "but" or "however."

The process so far described yields a graphic summary of the concepts and relationships that we as text analysts perceive the author to be communicating to potential learners. As such, the map could be used as a glorified outline for instructional purposes. In text description research, the map is particularly compelling in its display of the pattern of ideas, the extent of elaboration of particular sub-topics, and the types of connections that the author is inviting. However, by itself, the map is difficult to use in describing what readers actually learn from the text. To that end, we need the list of relationship propositions.

The relationship list. Every concept on the map is tied to some other concept by a relationship. The list of relationship propositions is derived by a simple and mechanical process of verbalizing what the map presents graphically, Concept A -- Relationship -- Concept B. The list presented in Table 3.1 is derived from our "Sharks, rays and skates" passage.

Although the process of deriving the list is relatively mechanical, we have found a number of conventions necessary when dealing with certain mapping problems:

1. The definition, or property, or example, or effect in a causal relationship, or second event in a temporal relationship, is always identified as Concept B in the list. Note that we have used the verb "precedes" to indicate the temporal relationship.
2. Whole relationship propositions may serve as concepts in a later propostion. For example, Propositions #9,12,24,28, and 33 in the list shown in Table 3.1 represent such cases. Proposition # 12 is particularly complex. It restates two properties of sharks mentioned in previous propositions, one of which (# 11) causes the shark to be placed in a separate class. These two properties are now concepts in Proposition 12 and are related to each other by a contrast ("is not similar to") relationship.
3. The order in which propositions are listed is not crucial. Usually, all properties and examples of a concept are given before that concept is then tied by a comparison, temporal or causal relationship to another concept.
4. Occasionally, a temporal, causal or comparative relationship co-exists with property relationships. In such cases, a vertical line appears on the map, separating the concept that is a property of a main concept from the temporal, causal or comparative symbol. Note the differences in the sections of the map (Figure 3.4) relevant to the following excerpt from our sample text. "...when a tooth is lost, another moves forward to replace it. The teeth slant backward to hold the food securely in the mouth. This, combined with great strength, make the shark a fearsome hunter." The relevant propositions are numbers 24 through 31. The first sentence depicts a fact or concept about teeth. That fact is a property of teeth (see Prop. 24). The concept itself breaks down into a temporal relationship between two sub-concepts (see Prop. 25). Each of these sub-concepts does not seem to have independent status as properties of the concept "teeth." By contrast, the next

Table 3.1

Relationship Proposition List for Sample Text

#	embed-dedness	Concept A	Relation-ship	Concept B
1.	1	Class Chondrichthyes	definition	cartilage fishes
2.	1	Class Chondrichthyes	property	thought to have developed early in Devonian period
3.	1	Class Chondrichthyes	property	are among fishes of ancient seas
4.	1	Class Chondrichthyes	property	many have survived relatively unchanged ingreat numbers
5.	1	Class Chondrichthyes	example	rays
6.	1	Class Chondrichthyes	example	skates
7.	1	Class Chondrichtyes	example	sharks
8.	2	sharks	similar to	true fishes
9.	3	sharks are similar to true fishes (#8)	property	inmany ways
10.	2	sharks	property	have certain differences
11.	3	have cartain differences	causes	places them in separate class
12.	4	sharks are similar to true fishes (#8)	not similar	have certain differences places them in separate class (#10, 11)
13.	2	sharks	property	have placoid scales
14.	3	placoid scales	property	have same origin as shark's teeth
15.	2	sharks	property	have mouth
16.	3	have mouth	property	horizontal slit
17.	3	have mouth	property	on ventral side of head
18.	2	sharks	property	have jaws
19.	3	have jaws	property	very strong
20.	3	have jaws	property	lined with teeth

Table 3.1 (continued)

#	embed-dedness	Concept A	Relation-ship	Concept B
21.	4	lined with teeth	property	razor-sharp
22.	4	lined with teeth	property	pointed
23.	4	lined with teeth	property	placed in several rows
24.	4	lined with teeth	property	when one tooth is lost precedes another moves forward to replace it (#25)
25.	5	when one tooth is lost	precedes	another moves forward to replace it
26.	4	lined with teeth	property	teeth slant backward
27.	5	teeth slant backward	causes	food to be held securely in mouth
28.	6	teeth slant backward causes food to be held securely in mouth (#27)	causes	fearsome hunter
29.	2	sharks	property	has great strength
30.	3	has great strength	causes	fearsome hunter
31.	2	sharks	property	fearsome hunter
32.	2	sharks	property	respiratory process
33.	3	respiratory process	property	water enters the mouth precedes water passes over gills (#34) precedes water forced out through separate pairs of gill slits (#37)
34.	4	water enters the mouth	precedes	water passes over gills
35.	5	gills	property	located on either side of head
36.	5	gills	property	are respiratory organs of fish
37.	5	water passes over gills	precedes	water forced out through separate pairs of gill slits

sentence differs in that "slanting backward" is a property of teeth (Prop. 26) and also a cause of "holding food securely in the mouth" (Prop. 27). However, this last concept, by itself, is not a property of teeth and thus a vertical line does not appear immediately after the causal arrow. The vertical line just before "fearsome hunter" indicates that a relationship proposition is needed to show the direct relationship between shark and fearsome hunter (Prop. 31).

Level of embeddedness. Once the list of relationship propositions is produced, the level of embeddedness of each proposition can be determined. Embeddedness refers to the number of ties that are needed to connect any concept to the main topic of a text. Concepts that are further from the main concept have higher embeddedness numbers. For example in Table 3.1, the propositions in which the topic of the text appears as Concept A (Props. 1-7) all have levels of embeddedness of 1. Proposition 28 is the most embedded idea and requires 6 steps before it is connected to the main topic.

The construct of embeddedness in mapping is related to the hierarchies of propositions produced using Kintsch's or Meyer's systems of anlysis and, like theirs, overlaps (more or less) with an intuitive or rated sense of the importance of concepts in a passage. On a study fully described in a later section of this report, we attempted to test this notion directly. We asked students to rate the importance of sentences corresponding to propositions. We then tested whether information more closely tied to the main topic (low embeddedness levels) received higher importance ratings than information further from the main topic (or highly embedded). Our prediction was confirmed. In addition, results of the learning study described in Part III of this chapter, in which high school students recalled passages taken from their textbooks, indicated that relationship propositions that were highly embedded were recalled less frequently. Thus, our formal system of indicating hierarchy of concepts, embeddedness, seems to be related to the intuitive concept of importance in text.

A caution is needed, however. Level of embeddedness is an artifact of the structure decisions made during mapping, and, to some degree, of the order of presentation of concepts within the text. In some cases, seemingly trivial concepts are used to introduce the topic of a text, are placed at the beginning of a passage, and so, show up as Level One relationship propostions, being connected only to the topic concept. For this reason, levels of embeddedness cannot be equated directly with an intuitive concept of "importance" although a high degree of correspondence can be expected as noted above.

Rated explicitness. As described earlier, concepts and relationships occasionally must be inferred in order to produce a coherent representation of the text. It is reasonable to expect that these items may cause difficulties for students reading the text. To test notions of whether and where authors remain implicit in presenting information and of how students respond to such processing demands, we need a method of indicating in our relationship list which parts of propositions were inferred in the process of representing the text. We have found that a judgment call, usually made by two raters working independently and then resolving differences in conference, works very well in that raters typically agree with each other on most decisions. The procedure involves taking each part of each proposition (Concept A, Relationship, Concept B), comparing it to the original text, and deciding whether the author has given an explicit indicator of that part in the text. In Table 3.1, the "O's" above the words indicate implicit information and the "I's" indicate explicit information. In comparison to other texts we have analyzed, the sample text used in this section is unusually explicit in rendering its structure.

We have found that explicitness decisions are fairly easy to make for the concept parts and for most of the relationships. The one difficulty occurs with the property relationship. Where for other relationships we adopted a fairly strict criterion of requiring an explicit marker of the relationship, we rated property relationships as explicit whenever the connection between two concepts was fairly obvious. Compare Proposition 15 to Proposition 13, 14, 16 and 17. Verbs of possession mark the connection between the two concepts in

Propositions 13, 14 and 16. The concepts of Proposition 17 are still relatively explicitly connected by being presented consecutively in the same sentence. Proposition 15 represents the property relationship that holds "sharks" with "mouth." We judge the relationship to be implicit because the concept "mouth" is given without introduction and without direct mention that the author is talking about a feature of sharks. Still, the decision is a relatively less assured one as indicated by the fact that two raters working independently came to different decisions and then voted for a rating of implicit after discussion.

Considering a relationship proposition as a single idea, varying types or degrees of explicitness are possible, ranging from a totally explicit relationship proposition (1-1-1) to a totally implicit relationship proposition (0-0-0). By rating each part of the relationship proposition individually, this method can identify cases where only the relationship has been inferred from the text (1-0-1) or where one or both of the concepts has been inferred (0-1-1, 1-1-0, or 0-1-0). In the samples we analyzed from high school biology and history textbooks, the most commonly implicity component was the relationship between concepts (1-0-1).

Problems and Promise

For any given concept in a text, mapping analysis indicates how it relates to other concepts, how explicitly the text states the concept and its relationships, and how embedded the concept is within the overall text structure. There are two major problems with the system we have developed. The first is that is is very much dependent upon the subjective judgment of the text analyst. Subjectivity comes in at the point of deciding what is a concept, what is the major topic of a text, what are the main structural relationships presented by the author (what is the overall shape of things), and what is explicitly stated in the text, for example. Granted we have developed certain guidelines to increase the consensuality of analysis. And granted we take our cue as much as possible from what the author is explicitly saying about a topic. However, the process is not a formal system in the way that Kintsch's micro-propositional analysis approximates.

Relational mapping provides a picture of what the text analyst understands to be the message of the author, and at best, that picture will be fairly reliable from one expert reader/analyst to the next.

The second major problem derives from the first and is related to the issue of alternate maps for the same text. In our analysis of naturally occurring pieces of discourse, we frequently found that two text analysts working independently represented the same text in radically different forms. Usually when this occurred, a discussion session would result in some sort of concensus map that "felt right" to both analysts. However, fairly often, we were struck by how ambiguous authors were in, say, indicating that they wished the reader to constrast two concepts rather than to simply describe them. In addition, we found that even where authors seemed to be following one distinct type of relationship pattern, a reader (or analyst in this case) could easily produce a very different map, reflecting a special question he or she was pursuing in reading the text.

This last problem may, in fact, turn out to be a virtue of relational mapping, reflecting its flexibility in representing text. As many have claimed (Pichert & Anderson, 1977; Harste, 1982), a text is not an object to be described apart from a comprehender. What makes a text a text is its coherent representation first in the author's and then in the reader's mind. The meaning and structure of a text are not inherent in the text but are invited by the author and imputed to the text by the reader. Our system captures this view of text and assigns responsibility to the text analyst to decide what structure of a text best reflects the purpose it is being used for. For instructional purposes, the system can be reponsive to teaching objectives and can be adopted by learners to help them use their textbooks for whatever purpose they are pursuing.

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PART 2: THE NATURE OF TEXTBOOK LANGUAGE

In this section, we report results related to our goal to describe and analyze the nature of expository text by sampling textbook passages and subjecting these to our mapping analysis. Our objective was to identify systematic patterns in the ways textbook authors present their ideas. In contrast to much of the existing empirical literature, we focused on "natural" pieces of discourse and attempted to examine them as much as possible within their natural ecological setting.

To this end, our general procedure was to enlist the advice of secondary teachers in identifying segments of their textbook that they considered important for their own students, asking these students to tell us how difficult they perceived the samples to be to study, then analyzing passages identified as easy and as difficult in terms of the concepts, relationships, and structural characteristics of the texts.

Method

Participants

The students and teachers who participated in this part of the study were selected from those who responded to the survey described in Section II. In Texas,one teacher of three sections of Biology and one teacher of one section of History participated. In Illinois, three Biology and three History teachers along with the students from one section for each teacher agreed to continue in the study. The selection of teachers and their students was based primarily on their report that, in their classes, the textbook used was an essential source of information.

Selection of Materials

The teachers' role. Each teacher was asked to identify the chapter or unit they would be addressing at a specific point (two months hence) in the spring semester. Within the selected chapters, they marked off specific sub-sections that they would NOT be assigning as required reading to their students. Thus, the teachers eliminated content they did not plan to emphasize, leaving us with those sections of text for which students would be held responsible, i.e., text integral to their curriculum.

Our (researchers) role. At this point, we needed to segment the relevant sections of chapters in order to test the reliability of our description of text and to have manageable amounts of material to be presented to students in a subsequent learning task (see Part III of this section). After reading the sections of each textbook chapter remaining subsequent to the teachers' elimination procedure, we decided that a natural unit size within these sections consisted of approximately 300 words. Many times the boundaries of a unit coincided with those demarcated by bold-face headings. We also decided that we would have a more powerful test of critical text characteristics that lead to difficulties in learning, if we took some measure to assure that our sample of texts represented a continuum of difficulty.

Across the teachers participating in Texas and in Illinois, three Biology and three History textbooks were represented. For each textbook, we selected eight samples of 250 to 300 words long from the sections deemed relevant by the teachers. We then prepared booklets consisting of the eight texts, each followed by a rating scale asking students to specify how difficult they judged it would be to study that text if it were given as a reading assignment (see Table 3.2). The last page of the booklet asked the students to take the eight passages in their booklet and to rank them in order of difficulty.

The students' role. At a point approximately two weeks away from when the target chapter was to be discussed in class, we introduced the rating/ranking task to the students. The procedure generally took from 40 to 50 minutes to complete. The students were told that, since the selections had been lifted from their textbooks, they could refer to their textbooks at any time they felt the need to reestablish the context of each passage. (No student was ever observed exercising this option.)

Results. From the students' responses, we chose 16 Biology and 14 History passages, half of each discipline having been judged difficult and half, easy to learn from. These 30 texts comprised the basic set used in subsequent text description and learning experiments. The texts together with their maps and list of relationship propositions appear in Appendix D.

Text Analysis Procedure

The details of the system we developed and of how that system guides decisions of text analysis have been described in Part I of this section. In applying the system to our sample of texts, graduate research assistants were trained and then assigned in pairs to work on producing a map of

Table 3.2

Opinion ratings solicited from high school students to determine their perception of the difficulty of texts

Keeping in mind how you typically use your textbook (for example - study for tests, answer the questions at the end of the chapter), complete the following:

I. In general, how easy was it for you to understand the section?

1	2	3	4	5
very easy	easy	medium	hard	very hard

II. Regardless of your answer to question I, tell us to what extent each of the following was a problem in the section.

	not a problem at all 1	a slight problem 2	a problem 3	an important problem 4
1. The section had many hard words which make it difficult to understand.				
2. The section is poorly organized, that is, it is written in a way that is difficult to follow.				
3. The section was difficult to understand because you were expected to have more background information than you had.				
4. The section was difficult to understand because it did not have enough examples or clarification of key ideas.				

each text in our sample. They worked independently and then met to decide on the map that seemed to capture "best" the intent of the text author.

Since mapping tends to encourage text analysts to focus on concepts while learners must deal with the actual surface representation of the concepts, we were concerned that our maps might deviate too far from the actual text language and might therefore cause special problems when it came time to score free recall protocols in the learning study. (Note that this potential deviation from surface representation would not be a problem in non-experimental settings.)

To check this potential deviation, we assigned two research assistants the job of deriving propositions in the Kintsch (1974), Meyer (1975) and Frederiksen (1975) sense from the texts. The maps were then compared to these lists of propositions and adjusted where necessary to represent explicitly any content, and in particular, any relation, that appeared in the proposition list.

The list of relationship propositions was then derived and each proposition was assigned an embeddedness number and rated for explicitness. All steps were performed by two analysts and differences of opinion resolved in conference.

Note that for the analyses reported in this and the next sections, the embeddedness rating was determined in a slightly different way than described in Part 1 of this chapter. We were faced with practical restrictions stemming from our computer program facilities to limit the number of possible levels of embeddedness to eight. Rather than simply counting the number of ties of every concept to the main topic of the text, a procedure that would frequently have exceeded our limit, the maps were divided into major sub-sections, corresponding to main points within a text. The following rules served as guidelines in identifying main sub-topics:

1. Any property subordinate to the topic concept and that has two or more subordinate concepts is a main sub-topic. (The number of subordinate concepts for the cutoff is somewhat arbitrary.)
2. Superordinate concepts in any large process box or example box may become main sub-topics.

3. Paragraph structure of the text may be used to validate selection of a main sub-topic when the preceding rules offer insufficient guidance.

The first step in determining levels of embeddedness, then, was to designate main sub-topics on the map by assigning them unique one-digit numbers. These numbers served as the first digits of a string of digits describing how subordinate concepts were related to the main concept. There are nine numbers that can then appear after the decimal, each number uniquely representing each of the nine relationship types allowed by the system. By this system, embeddedness numbers are not unique to each relationship proposition. For example, two examples of a main concept at the same level of embeddedness would have exactly the same digit string. The final digit in each string describes how Concept B of the given relationship proposition is related to its Concept A.

The actual level of embeddedness is measured by counting the number of digits beyond the initial main concept digit; that is, behind the decimal point. In most of the analyses we conducted, we used the embeddedness level to form two categories, "high" ideas being identified by relationship propositions one or two steps away from the main sub-topics and "low" ideas identified as propositions three or more steps from the main sub-topics.

Results

In this sections, we present the descriptive tables of our 30 sample texts in terms of the products that fall out of a relational mapping analysis. Thus we report text characteristics related to types of relationships, levels of embeddedness and degree of explicitness. In this and all subsequent analyses of text characteristics, we have kept the biology and history texts separate.

In the summary tables that follow, the total number of propositions and parts of propositions is listed identified by the two variables on the cell margins. We report our analyses of the 16 Biology samples and 14 History texts separately. Each set of texts is described using three different breakdowns of the variables that derive from relational mapping: 1) level of embeddedness (high = 1 or 2 steps from a main topic, low = more than 2 steps) by explicitness (explicit = all parts are explicit, implicit = any one of the three parts of the proposition is implicit);

2) level of embeddedness by relationship type (the nine relationship types of the system were reduced to six by combining all the comparative relationships "greater than," "less than," "similar," "is not similar," into one category); 3) relationship type by explicitness. For each of these breakdowns, we report the numbers relevant to describing 1) the whole proposition (ALLS), 2) the two concepts in the propositions (Concept A and Concept B), and 3) the relationship part. Note that the numbers appearing the the total columns for the concept parts will be twice as large as those for the whole proposition (ALLS) since every proposition includes two concepts.

As indicated in Table 3.3 propositions of the biology texts were evenly divided between those closely tied to the main topic and those further away. There were nearly twice as many propositions that had all three parts (Concepts A and B and the relationship) explicitly rendered in the text as propositions that had at least one implicit part. However, it is interesting to note that 35% of the high level propositions fell in the implicit category. Of the high level propositions 29% were rated implicit because the relationship part of the proposition was not explicit. This suggests that our textbook authors frequently were not explicit in how two high level concepts were related.

The pattern for history texts was very similar, as shown in Table 3.4 except that the relative proportion of propositions closely tied to the main topic was substantially larger. Again, the proportion of high level propositions that were rated implicit was quite high, making up 48% of the units close to the main topic. Implicit relationship parts appeared in 41% of the high level propositions.

What is noteworthy in Table 3.5 is that the majority of the relationships in our biology texts were properties (57%). If we combine properties with examples, we account for 76% of the relationships. Process relationships (temporal and causal) make up only 12% of the total. History texts show much the same pattern (see Table 3.6). Again, properties and examples make up 76% of the total number of propositions, with process relationships taking up only 15%.

In Tables 3.7 and 3.8, frequencies are reported for propositions representing explicit and implicit renderings of the different relationship types. For biology texts most relationship types are much more

Table 3.3

Biology: Number of propositions and parts of propositions identified by level of embeddedness and explicitness

1. ALLS (the whole propositions)

	Explicitness		
Level	Implicit	Explicit	Total
High	155	283	438
Low	119	310	429
Total	274	593	

2. Concepts A & B

Level	Implicit	Explicit	Total
High	71	805	876
Low	45	813	858
Total	116	1618	

3. Relationships

Level	Implicit	Explicit	Total
High	127	311	438
Low	107	332	429
Total	234	633	

Table 3.4

History: Number of propositions and parts of propositions identified by level of embeddedness and explicitness

1. ALLS

	Explicitness		
Level	Implicit	Explicit	Total
High	169	182	351
Low	63	165	228
Total	232	347	579

2. Concepts A & B

Level	Implicit	Explicit	Total
High	59	643	702
Low	4	452	456
Total	63	1095	

3. Relationships

Level	Implicit	Explicit	Total
High	145	206	351
Low	62	166	228
Total	207	372	

Table 3.5

Biology: Number of propositions and parts of propositions identified by level of embeddedness and relationship type

1. ALLS

Type	High	Level Low	Total
Definition	8	12	20
Property	272	220	492
Example	98	73	171
Comparison	27	49	76
Temporal	11	44	55
Causal	22	31	53
Total	438	429	867

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2. Concepts A & B

In this case, this breakdown is redundant with the above numbers. Simply take the frequencies listed above and double them.

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3. Relationships

Exactly redundant with the above numbers.

Table 3.6

History: Number of propositions and parts of propositions identified by level of embeddedness and relationship type

1. ALLS

Type	Level High	Low	Total
Definition	3	5	8
Property	171	113	284
Example	109	47	156
Comparison	31	13	44
Temporal	17	21	38
Causal	20	29	49
Total	351	228	579

2. Concepts A & B

Frequencies are redundant with the above except that each number needs to be doubled.

3. Relationships

Exactly redundant with frequencies for whole propositions.

Table 3.7

Biology: Number of propositions and parts of propositions identified by explicitness and relationship type

1. ALLS			2. Concepts A & B		3. Relationship	
	Explicitness		Explicitness		Explicitness	
Type	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.
Definition	4	16	2	38	5	16
Property	90	402	55	929	61	431
Example	108	63	37	305	103	67
Comparison	23	53	11	141	18	58
Temporal	36	19	7	103	36	19
Causal	13	40	4	102	11	42
Total	274	593	116	1618	234	633

Table 3.8

History: Number of propositions and parts of propositions identified by explicitness and relationship type

	1. ALLS		2. Concepts A & B		3. Relationship	
	Explicitness		Explicitness		Explicitness	
Type	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.
Definition	2	6	0	16	2	6
Property	66	218	35	533	46	238
Example	108	48	20	292	105	51
Comparison	11	33	3	85	9	35
Temporal	22	16	0	76	22	16
Causal	23	26	5	93	23	26
Total	232	347	63	1095	207	372

often stated explicitly by the authors than implicitly. The two notable exceptions are example and temporal relationships, for which implicit propositions are nearly twice as frequent as explicit propositions. For these, nearly all implicit ratings come from having the relationship part rendered implicitly. History texts show the same pattern. Example relationships are particularly likely to remain implicit in history texts, occurring twice as often as explicit example propositions and making up nearly half of all implicit relationships in the texts.

Discussion

The results described above represent a summary of text features that are emphasized by our relational mapping procedure. From these we can say that the authors of the History and Biology textbooks we sampled were frequently implicit about how ideas they were relating were logically connected to each other. High level ideas, or ideas that are close to the main topic of a text, were more likely to remain implicitly tied to lower ideas in a text than to be directly explicated. In addition, we found that our authors relied on properties and examples as the major way of developing topics. Nevertheless, 24% of their ideas pertained to the distinctive relationships (definition, comparison, temporal, and causal) that relational mapping depicts so well.

At this point, what remained to be established was the relative contribution of these text features to students' facility with learning from the texts. This issue is taken up in the next part.

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PART 3: THE LEARNABILITY OF TEXTBOOK LANGUAGE

The purpose of this aspect of our project was to determine how well high school students would learn from their textbooks. We hoped to use their performance on recall and recognition measures to identify those features, out of the many possible that can be derived from relational mapping, that coincided with learning difficulties. Our general procedure was distinguished by having students tested on information from their own textbooks in their own classrooms at the point in the school semester when the target segments of the textbooks were about to be discussed in class. Thus naturalistic conditions for learning in the content areas were approached.

Method

Subjects

The same students who had rated passages taken from their textbooks participated. To repeat, we had three sections of 10th grade level Biology (60 students) and one section of 10th grade American History (17 Ss) in Austin. In Illinois, three Biology and three History classes participated (range of n = 14 to 18).

Procedure and Materials

Across all participants, the texts were the 30 selected, analyzed and described in Part 2. For each student, only two passages were presented as part of the learning study. For each of these two texts, as well as for a practice text selected from the same textbook, the students followed an eight-step procedure:

Step 1. Predict on a scale from 1 to 4 how well you will understand the following selection which has been taken from your textbook.

Step 2. Read and learn the text as best as you can for as long as it takes you to be ready for a test.

Step 3. Rate how well you understood the selection you just read.

Step 4. Write down as thoroughly as you can everything you can remember from the selection without referring back to the passage (free recall).

Step 5. Answer the following short-answer questions as best can. (Approximately six short answer questions followed each passage. At least two adult readers formulated a set of questions for each passage, and those questions which recurred across sets were selected for use in the experiment.)

Step 6. Rate each question in terms of how similar it is to one your teacher would ask. (The scale ran from 1 to 5.)

Step 7. Given a list of eight statements, choose three that best represent the main ideas in the section. (Again, a set of statements were generated by at least two adult readers, and those statements which recurred across sets were selected. Threee statements perceived to be superordinate or main ideas and five statements perceived to be subordinate or details were included in each set of eight.)

Setp 8. Now that you have been tested on what you know about the previous selection, rate how well you think you understood it.

The students received their packets in an envelope. They were instructed to go through the steps involved with the practice passage although they did not have to actually produce responses to the measures. They then proceded at their own pace through the two critical text samples and their associated measures. Total time allowed for the whole procedure was the equivalent of one class period and most students had finished after 45 minutes.

In this section of the report, we will discuss results stemming solely from the students' responses to the free recall task. Other measures are discussed as part of the section on reader characteristics (Section V).

Scoring

All free recall protocols produced in response to one text were grouped together. Two graduate research assistants were assigned to each text. They were instructed to begin by independently scoring two or so fairly long protocols. They then met to discuss the rationale for each of their scoring decisions. They then identified randomly three or four protocols that they would both score independently and that would become the basis of a reliability estimate for free recall scoring. The rest of the protocols associated with any one text were then divided evenly between the two scorers and also scored independently. This procedure was followed for all 30 texts, with six research assistants associated with the project being paired and re-paired in all possible combinations. We hoped that this procedure would mitigate against any bias creeping into the scoring of the protocols.

The scoring procedure that each research assistant followed involved six basic steps:

✓ 0

Step 1. Read original text, absorb map, read through the list of relationships.

Step 2. Read through student's protocol.

Step 3. Read the first phrase or sentence and locate where in the list of relationships it seems to be talking about.

Step 4. Decide on the first relationship to be scored. Each relationship has the potential of being scored 4 times: once for each of the parts and then once again as a whole. We number these as follows:
If it is Relationship #10 we feel is being mentioned by S, we score
10.1 = is Concept I (A) of the relationship there at all?

10.2 = is the relationship there?

10.3 = is Concept II (B) there?

10.0 = is this whole relationship proposition present?

Step 5. Now we decide if each of these (10.1, 10.2, and so on) is to be scored

A = correct and explicitly stated. Accept a close paraphrase.

B = correct and implicitly stated (by the student, not the text). Often a B is given when student provided a more general descriptor of a concept or provided a a superordinate or subordinate type term that implies the explicit statement of the concept or relation.

C = explicit (and some implicit responses that are very obvious) and wrong.

V = give this score to a statement on part of student that you cannot relate to any relationship proposition but that is correct and about the topic of the text in a general way.

All statements by the student should be accounted for by the time you finish.

Step 6. Apply some conventions we've decided on:

1. If any part of a relationship proposition gets a C, the whole (e.g., 10.0) gets a C (if all parts are present).
2. If any part of a relationship proposition gets a B, the whole thing gets a B (if all parts are present).
3. If a technical term is not mentioned but a general and correct descriptor is substituted, the person would get a B. If the actual technical term is used correctly later on, re-score the first Relationship proposition that uses that term and give it an A. (Don't worry too much about this convention.)

4. Whenever a part or a whole proposition gets scored twice, the record should only show the highest (A > B > C) score and only once.

In Appendix E, examples of two protocols produced in response to Text #116, "Protozoa," appear. Scoring and the rationale of each scoring decision is given.

Data Analysis

In our first look at the data generated from the free recall protocols, we were interested in identifying the contribution of particular text features to students' ability to recall the excerpts from their textbooks. Thus we chose relationship propositions as the replication factor and created scores for each relationship proposition that reflected the proportion of students assigned to learn the text who had actually recalled that relationship proposition. The "n" in the analyses reported below becomes the number of propositions identified by the factors of the designs and can be found by referring to the appropriate tables in Part II (see Tables 3.3 to 3.8).

Results

Summary of Analyses

The proportions generated for each relationship proposition were normalized using arcsin transformations. They were then subjected to a series of two-way analyses of variance. Biology and History texts were analyzed separately. In the following tables, the numbers refer to the mean proportion score (re-converted from the arcsin transformation score) received by units of the type specified by factors identified in the table margins. In other words, the entries in the tables represent the average proportion of students who recalled units of the identified type.

The same three major breakdowns of text characteristics that were used to describe the texts were used to analyze the recall data: 1) level of embeddedness (high = 1 or 2 steps from a main topic, low = more than 2 steps) by explicitness (explicit = all parts are explicit, implicit = any one of the three parts of the proposition is implicit); 2) level of embeddedness by relationship type (the nine relationship types of the system were reduced to six by combining all the comparative relationships "greater than," "less than," "similar," "is not similar," into one category); 3) relationship type by explicitness.

For each of these combinations of factors, we looked at the proportion scores for the whole proposition (identified as the .0 scores in the scoring system), for the concept parts combined (identified as the .1 and .3 scores in the scoring system), and for the relationship part alone (the .2 scores of the relationship propositions). All of the above analyses were performed using only units that had received an "A" score (explicit recall) and then in separate analyses, units that had received a "B" score (implicit recall). For the whole proposition scores, we also ran analyses in which the proportion scores were computed with any proposition receiving an "A" OR a "B" being tallied.

Embeddedness by Explicitness

In Tables 3.9 and 3.10, we present the Biology and History mean proportion scores of the whole propositions identified by level of embeddedness and explicitness. The main effects were nearly always significant as was the interaction for the History texts. Thus we can say that students are more likely to recall ideas closely tied to the main topic of the texts (high in the text structure, low in embeddedness). Ideas that the authors state explicitly are more likely to be mentioned both explicitly and when explicit and implicit recall scores are totaled. The bottom third of each of the tables is particularly interesting in that the special disadvantage that ideas high in a text's structure have if authors are in any way implicit in presenting them is revealed even when implicit recall is credited.

These summary descriptions are corroborated when individual parts of propositions, either the two concepts or the relationships, are analyzed (see Tables 1 to 5 in Appendix F).

Embeddedness by Relationship Type

The mean proportion scores for whole propositions identified by level of embeddedness and relationship type appear in Tables 3.11 and 3.12. The same proportions for the concept parts combined and the relationship parts appear in Tables 5 to 8 in Appendix F. Again the two main effects are nearly always significant. Definition propositions seem to be favored by students learning Biology texts, followed by property propositions. When the combined A and B recall scores are used, temporal and causal propositions show a definite improvement in their

Table 3.9

Biology: Mean proportion scores for whole (ALLS) relationship propositions identified by level and explicitness

1. A scores (units judged to be explicitly recalled)

Level*	Explicitness**		
	Imp	Exp	Total
High	.081	.166	.136
Low	.071	.114	.102
Total	.077	.139	

*F (1,863) = 9.94, p = .002

**F (1,863) = 24.47, p = .001

Level X Exp: F (1,863) = 2.56, p = .110

2. B scores (units judged to be implicitly or partially recalled)

Level*	Explicitness**		
	Imp	Exp	Total
High	.128	.085	.100
Low	.098	.067	.076
Total	.115	.076	

*F (1,863) = 6.1, p = .014

**F (1,863) = 15.67, p = .001

Level X Exp: F (1,863) = .476, p = .491

3. A + B scores totaled

Level*	Explicitness**		
	Imp	Exp	Total
High	.209	.251	.236
Low	.169	.181	.178
Total	.192	.215	

*F (1,863) = 15.01, p = .001

**F (1,863) = 2.84, p = .092

Level X Exp: F (1,863)= .767, p = .381

Table 3.10

History: Mean Proportion scores for whole (ALLS) relationship propositions identified by level and explicitness

	1. A scores (units judged to be explicitly recalled)			2. B scores (units judged to be implicitly or partially recalled)			3. A + B scores totaled		
	Explicitness**			Explicitness**			Explicitness**		
Level*	Imp	Exp	Total	Imp	Exp	Total	Imp	Exp	Total
High	.067	.145	.107	.115	.101	.108	.182	.245	.215
Low	.070	.100	.092	.140	.074	.092	.210	.174	.184
Total	.068	.124		.122	.088		.190	.212	.203
	*F (1,575) = 5.63, p = .018			*F (1,575) = .65, p = .421			*F (1,575) = 5.43, p = .02		
	**F (1,575) = 27.91, p = .053			**F (1,575) = 8.93, p = .003			**F (1,575) = 3.52, p = .06		
	Level X Exp: F (1,575) = 3.75, p = .053			Level X Exp: F(1,575) = 5.15, p = .024			Level X Exp: F(1,575) = 9.10, p = .003		

Table 3.11

Biology: Mean proportion scores for whole (ALLS) relationship propositions indentified by embeddedness and relationship type.

	1. A scores (explicit recall)			2. B score (implicit/partial recall)			3. A + B scores		
	Level*			Level*			Level*		
Type**	High	Low	Total	High	Low	Total	High	Low	Total
Def	.370	.094	.204	.129	.075	.097	.499	.169	.301
Prop	.167	.134	.151	.086	.058	.074	.251	.192	.225
Examp	.073	.034	.056	.133	.124	.129	.207	.158	.186
Comp	.108	.034	.061	.055	.056	.056	.163	.091	.117
Temp	.027	.141	.118	.166	.087	.103	.193	.228	.221
Caus	.059	.093	.079	.140	.103	.118	.199	.196	.197
Total	.136	.102		.100	.076		.236	.178	
	*F (1,855) = 6.72, p = .01 **F (5,855) = 10.34, p = .001			*F (1,855) = 8.03, p = .005 **F (5,855) = 6.60, p = .001			*F (1,855) = 13.11, p = .001 **F (5,855) = 3.81, p = .002		
	Type X Level: F(5,855) = 3.58, p = .003			Type X Level: F(5,855) = .69, p = .634			Type X Level: F(5,855) = 1.11, p = .354		

Table 3.12

History: Mean proportion scores for whole (ALLS) relationship propositions identified by embeddedmess and relationship type.

	1. A scores (explicit recall)			2. B score (implicit/partial recall)			3. A + B scores		
	Level*			Level*			Level*		
Type**	High	Low	Total	High	Low	Total	High	Low	Total
Def	.163	.015	.071	.117	.176	.154	.280	.191	.225
Prop	.155	.112	.138	.076	.061	.070	.230	.173	.208
Examp	.036	.017	.030	.165	.149	.160	.201	.166	.191
Comp	.058	.048	.055	.045	.056	.048	.103	.104	.103
Temp	.131	.146	.139	.096	.068	.080	.226	.214	.220
Caus	.135	.131	.132	.174	.141	.154	.309	.271	.286
Total	.107	.092		.108	.092		.215	.184	
	*F (1,567 = 6.56, p = .001			*F (1,567) = 2.01, p = .157			*F (1,567) = 7.84, p = .005		
	**F (5,567) = 17.14, p = .001			**F (5,567) = 15.64, p = .001			**F (5,567) = 5.87, p = .001		
	Type X Level: F (5,567) = .86, p = .509			Type X Level: F(5,567) = .31, p = .906			Type X Level: F(5,567) = .29, p = .916		

recallability. For History texts, causal, temporal, and property propositions are favored for explicit recall. In both Biology and History texts, comparative propositions are not well recalled. The low scores for the example propositions are interesting, given the high frequency with which they occur, making up 27% of total number of propositions in History texts and 19% of those in Biology.

Explicitness by Relationship Type

Mean proportion scores for whole propositions categorized in terms of relationship type and explicitness are reported in Tables 3.13 and 3.14. Tables 9 to 12 in Appendix F provide a summary of the same information for the concept parts and relationship parts.

Discussion

Several cautions are in order before we can draw conclusions from the data. Most importantly, although we attempted as much as possible to gather our data on the learnability of text under as naturalistic study conditions as we could, we came nowhere near reaching that goal. Students were faced with a study and testing situation that was unusual for them, presented by an outsider, and restricted in terms of time to one class period. They could not ask questions or discuss content while they read. They were tested under free recall instructions to produce everything they remembered from a text. And, while most students worked industriously, a significant number were observed to be less than cooperative. These conditions should be kept in mind as we draw generalizations from our results.

The overall level of recall taking into account any proposition recalled either explicitly or implicitly never exceeded 21% for either History or Biology texts. Students seemed to have great difficulty recalling information that authors only implied in their texts. Example propositions, ideas that state that a concept is tied to another by virtue of being its example, were surprisingly vulnerable in students' recall.

On a more positive note, students were sensitive to the centrality of any idea in that they favored ideas high in text structure, closely tied to the main topic and sub-topics of a text This finding is in agreement with results stemming from a number of other studies (Pichert and Anderson, 1977, and Meyer, 1975) and lends validity to the concept

Table 3.13

Biology: Mean proportion scores for whole (ALLS) relationship propositions identified by explicitness and relationship type.

	1. A scores (explicit recall)			2. B score (implicit/partial recall)			3. A + B scores		
	Explicitness*			Explicitness*			Explicitness*		
Type**	Imp	Exp	Total	Imp	Exp	Total	Imp	Exp	Total
Def	.050	.243	.204	.123	.090	.097	.173	.333	.301
Prop	.119	.158	.151	.105	.066	.074	.224	.225	.225
Examp	.044	.078	.056	.138	.114	.129	.182	.193	.186
Comp	.033	.073	.061	.069	.050	.056	.102	.123	.117
Temp	.122	.111	.118	.115	.080	.103	.237	.191	.221
Caus	.020	.098	.079	.069	.134	.118	.089	.232	.197
Total	.077	.139		.115	.176		.192	.215	
	*F (1,855) = 7.70, p = .006			*F (1,855) = 6.32, p = .012			*F (1,855) = .58, p = .444		
	**F (5,855) = 7.43, p = .001			**F (5,855) = 4.32, p = .001			**F (5,855) = 3.72, p = .002		
	Type X Exp: F(5,855) = .77, p = .572			Type X Exp: F (5,855) = 1.16, p = .327			Type X Exp: F (5,855) = 1.11, p = .354		

Table 3.14

History: Mean proportion scores for whole (ALLS) relationship propositions identified by explicitness and relationship type

	1. A scores (explicit recall)			2. B score (implicit/partial recall)			3. A + B scores		
	Explicitness*			Explicitness*			Explicitness*		
Type**	Imp	Exp	Total	Imp	Exp	Total	Imp	Exp	Total
Def	0	.094	.071	.056	.186	.154	.056	.281	.225
Prop	.100	.149	.138	.067	.071	.070	.167	.220	.208
Examp	.031	.028	.030	.166	.148	.160	.197	.176	.191
Comp	.027	.065	.055	.041	.051	.048	.067	.116	.103
Temp	.107	.183	.139	.090	.067	.080	.197	.250	.220
Caus	.132	.133	.132	.149	.158	.154	.281	.291	.286
Total	.068	.124		.122	.088		.190	.212	
	*F (1,567) = 6.50, p = .011			*F (1,567) = .04, p = .847			*F (1,567) = 2.94, p = .087		
	**F (5,567) = 12.32, p = .001			**F (5,567) = 13.42, p = .001			**F (5,567) = 5.28, p = .001		
	Type X Exp: F(5,567) = 1.07, p = .376			Type X Exp: F(5,567) = .62, p = .688			Type X Exp: F(5,567) = 1.13, p = .345		

of embeddedness as defined by our relational mapping analysis.

Our major recommendation to textbook authors based on our findings is that they consider making the connections between ideas more explicit, particularly when relating concepts that are crucial to the development of a topic. To teachers, we suggest that they examine their textbooks, and perhaps their lectures, for instances of important information not explicitly tied by a relationship marker to other information in the text. We are of course aware that there are many potential uses of a textbook in a classroom and as many ways of selecting information to be emphasized and tested. In classrooms where the teacher generally asks very specific, low level (detail) questions that are explicitly stated in the text, our recommendations will not suit. However, in classrooms where tests measure how well students are getting the broad "picture" of a topic, and where they are expected to learn from their textbooks, teachers should be aware, we believe, of the special difficulties incurred by the texts they assign.

References

Meyer, B. J. F. The organization of prose and its effect on memory. Amsterdam: North-Holland Publishing Company, 1975.

Pichert, J. W., & Anderson, R. C. Taking different perspectives on a story. Journal of Educationl Psychology, 1977, 69, 309-315.

PART 4: TOPIC CONTINUITY AND COHESION: ASPECTS OF COHERENCE

Our desire to study coherence stemmed from our interest in examining those text characteristics that contribute to how well a test fits together or coheres for a reader. For this purpose we decided to examine: 1) the extent to which selected cohesive ties contributed to or detracted from coherence, and 2) the general continuity or topical flow across sentences.

Cohesive Ties

Cohesion is described by Halliday & Hassan (1976) as providing the linguistic mortar by which sentences are held together. For example, in the sentences

> Why are protozoa called animals?
> They voraciously consume their food in chunks.
> They are active and responsive.

They and their are cohesive items presupposing the word protozoa. Together, the presupposing and presupposed items define a cohesive tie.

There are several types of such ties. There are reference ties whose pronouns, usually in one sentence, presuppose some noun or noun phrase in another sentence as in the example above. There are substitution ties where words such as one substitute for and thereby presuppose previous reference to a noun or noun phrase. There are ties of ellipsis where the absence of a presupposing item assumes a presupposed item or phrase. There are ties of conjunction where connectives are used to relate sentences. Finally, there are lexical ties where items are tied by reiteration or collocation, where items have the semantic potential of appearing together in a text. In Halliday & Hassan's Cohesion in English, the description of the totality of such ties in a text constitutes the text's cohesion--the extent to which a text is internally and formally coherent.

In describing the cohesion of our texts, we were not interested in providing a statistical account of the number of ties that exist for any single text or set of texts. Instead, we were interested in individual instances of ties and the extent to which they were apt to disrupt the construction of meaning as a student reads a text.

In a related study, Tierney & Mosenthal (1980) had examined the relationship of a statistical accounting of ties to coherence rankings of text. In their study, a design was set up which afforded comparisons of the numbers of ties across a range of writing samples on the same topic and with the same structure. They found that cohesive analysis did not predict or determine textual coherence for a reader. To establish this, student sriters wrote on two different topics, with one group of them familiar with one of the topics. Cohesive analysis of the students' texts revealed significant differences between texts written on the two different topics, but no difference between familiar and unfamiliar writers writing on the same topic. In other words, cohesion was more a consequence than a determinant of content coherence. Of relevance to present analyses, Tierney & Mosenthal argued against comparing ties across texts or assuming any number of ties was a predictor of coherence. Instead, their data encouraged us to examine individual instances of ties within passages. As Tierney & Mosenthal (1980) asserted we saw the value of the cohesion concept was in singling out individual items, for example, anaphoric, connective, lexically cohesive items,--as possible sources of ambiguity or disruptions of the reader. From this perspective, we were not interest in the identification of global coherence but in the location of ambiguous instances that might detract from local coherence of the text.

Method

Materials. From our pool of over 30 text samples, we selected eight passages for our analysis. These passages represented a wide array of topics from both history and biology (#101-frogs, #105-muscles, #112-reproduction in fishes, #103-snakes, #225-Roosevelt, #219-ranching, #226-depression, #223-dust bowl years; see Appendix D) and a variety of patterns (time-sequence, cause-effect, compare-contrast).

Cohesion analysis. Our analysis of individual ties proceeded as follows. First, cohesive items (instances of reference, substitution and ellipsis) were identified and categorized. To trace the referent of these ties, we looked first in the sentence directly proceeding the item, continuing to go back until the referent was located. On only a few occasions was the referent found in a succeeding sentence (a cataphoric reference). In addition, we recorded the distance between the presupposed item and the referent by counting how many sentences away the antecedent was. Table 3.15 represents an example of the type

Table 3.15

Inter-Sentence Cohesive Ties

Line	Cohesive Item	Type/Ease of Resolution	Where Resolved	Distance
1	he	Ref. PR/1	same	same S
2	this	Ref. DR/3	1 & 2(deal with crisis)	1 S
	him	Ref. PR/1	1 (Roosevelt)	1 S
3	he	Ref. PR/1	1 (Roosevelt)	2 S
	they	Ref. RP/1	same	same S
4	the (President)	Ref. DR/3	1 (Roosevelt)	3 S
	he	Ref. PR/1	1 (Roosevelt)	3 S
	them	Ref. PR/1	same (laws)	same S
	he	Ref. PR/1	1 (Roosevelt)	3 S
5	other (legislation)	Ref. CR/1	same (laws)	same S
	His	Ref. PR/a	1 (Roosevelt)	4 S
6	his	Ref. PR/1	1 (Roosevelt)	S
7	He	Ref. PR/1	1 (Roosevelt)	5 S
8	one	Ellipsis NE/1	same (plays)	same S
	another	Ellipsis NE/1	same (plays)	same S
	he	Ref. PR/1	1 (Roosevelt)	6 S
9	better than	Ref. CR/1	same	same S
10	that	Ref. DR/1	same (program)	same S
11	that	Ref. DR/1	same (program)	same S
12	he	Ref. PR/1	same (Wilson)	same S
	it	Ref. PR/3	10 (New Deal)	1 S
13	It	Ref. PR/2	10 (New Deal)	2 S

of analysis that we conducted for each of our eight texts. The analysis displayed is for text #225, First phase of the New Deal: Try Something.

Procedure. For purposes of determining the degree of ambiguity and significance of the various ties, students were asked to assess the ease of resolution and importance of each tie. Each presupposing word was italicized and under the word was placed two response slots. One response slot was marked "E: for Ease of resolution; the second item was marked "I" for importance. An excerpt from one of these rating sheets appears in Table 3.16. The passages were then presented to high school students whose task it was to rate the extent to which referential items were easy to resolve and the extent to which they were important or significant to understanding the text. Specifically, once we were sure the subjects understood the notions of presupposed items, presupposing item and tie, the directions given to each subject were as follows: "As you read the passage for the first time, mark the ease of resolution under each italicized word. After you have read the passage and marked the ease of resolution for each of the italicized words, return and mark the importance of each tie." Marking the ease of resolution and importance entailed rating on a scale from one to five the perceived ease with which an antecedent could be determined (5 being most difficult) and the importance of the tie to developing an understanding of the text (5 being most important).

Since the tasks required of the subjects were quite difficult and time-consuming, we asked individual students to respond only to one of the eight texts. Each text was rated by two students working independently. Graphs of their responses appear in Appendix G.

Results

While our analysis proceeded on the basis of an examination of individual items of cohesion, our interest was in findings that would emerge across passages and across subject areas. Across passages, referential ties were the most frequently occurring type of cohesive element. Pronouns were the items that students most often identified as difficult to resolve and also, important. Whether or not a particular tie was considered important or difficult to resolve was not affected by distance. The distance between antecedent and referent fluctuated from one item to the next regardless of the tie and did not have any

Table 3.16

Example of rating sheet for ease of resolution and importance ratings

---

First Phase of the New Deal: "Try Something"

Roosevelt came into office with no very clear idea of how *he* was
1. E___ I___
going to deal with the economic crisis. *This* did not dismay *him*. "There
2. E___ I___ 3. E___ I___
is nothing to do," *he* said, "but meet each day's troubles as *they* come."
4. E___ I___ 5. E___ I___
Some laws were passed against *the* President's wishes, but *he* signed *them* to
6. E___ I___ 7. E___ I___ 8. E___ I___
head off something *he* liked even less, or to avoid holding up *other* legislation.
9. E___ I___ 10. E___ I___
His principal contribution to the New Deal, in addition to dynamic leadership
11. E___ I___
and political skill, was *his* "try something" philosophy. *He* likened himself
12. E___ I___ 13. E___ I___
to a quarterback on a football team who calls plays, and if *one* does not
14. E___ I___
work, tries *another*. In any case, *he* felt, action was *better than* inaction.
15. E___ I___ 16. E___ I___ 17. E___ I___
The New Deal was thus no carefully worked out program, like *that* of
18. E___ I___
Alexander Hamilton in the Washington administration, or *that* proposed by
19. E___ I___
Woodrow Wilson when *he* took office in 1913. Instead, *it* reflected the haste
20. E___ I___ 21. E___ I___
which went with trying to attack the depression on many fronts at once.

general influence upon importance.

Across social studies and biology passages, the individual items with the highest importance ratings tended to have higher difficulty ratings in science texts than similar items in the social studies text. This suggests that the science passages contain more instances of ties which are, at the same time, important and difficult to resolve. It is reasonable to assume that these items are more crucial than those that were rated difficult to resolve but low in importance.

Within passages, the findings support the results of Tierney & Mosenthal (1980). The variation across ties and across subjects is prima facie evidence of the problems associated with trying to represent coherence by aggregating across cohesive ties. Although the overall correlations between subjects for the six passages was quite high (.3 to .4), the extent to which the ratings are erratic across the graphs shown in Appendix G is impressive. There is considerable variation from one tie to the next, and even for the same tie rated by different readers. Nonetheless, within every one of the eight texts, there were some ties (usually at least five) which readers agreed were, at the same time, difficult to resolve and important.

To explore whether there were certain text features associated with those ties that were rated as crucial and, also, difficult to resolve we pursued a more subjective examination. It appeared that a variety of factors were contributing to the ambiguity of these ties. Sometimes the difficulty seemed related to vague or unfamiliar antecedents. At other times, the problem seemed to be related to the scope of the antecedent. For example, in the paragraph below the underlined elements (identified as important & difficult to resolve) have antecedents which would likely be difficult to trace unless the reader was quite knowledgeable.

> In male fish, the sex organs are called testes. These develop sperm cells. When the female lays the egges, the male swims over them. The male discharges milt into the eggs. Milt is a fluid containing sperm. The sperm swims to the eggs and fertilze them. This is external fertilization.
>
> (Taken from #112 Reproduction in Fishes)

Sometimes items that were difficult to resolve and important seemed associated with unannounced shifts in the topic. For example, in the following text, the shift from "snakes" as the topic to "eyes," together with the repetitive use of "those" for "snakes" is quite problematic.

> Different snakes have different shaped pupils in their eyes. Those most active in daylight have round pupils. Those most active at night have elliptical pupils similar to those of cats.
> (Taken from #103 The Structure of a Snake's Head)

Other instances appear to be associated with an author's failure to clearly establish an antecedent or a frame of reference that the reader would "carry with" him or her throughout their reading of the passage. The following two examples are taken from one of our social studies text. The first was taken from the final paragraph of text #225 which discussed the New Deal. The second occurred in the first paragraph of Passage #219 on ranching.

> Such was the general nature of the Great Experiment that President Roosevelt and the Congress launched in the Spring of 1933.

In this example, "such" referred to the entire discussion dealing with the New Deal which had proceeded for a couple of paragraphs. We would predict that some readers would have difficulty with this cohesive item due to their failure to realize the scope of its antecedent.

> By the 1890's the western cattle industry centered in the high plains running through eastern Montana, Wyoming, Colorado, the New Mexico Territory and Western Texas. Most ranchers by now owned their grazing land and fenced it in with barbed wire.

In this example, now referred to 1980 which was mentioned in the first line, but never re-established clearly or fully.

Concluding remarks

In general, then, we would suggest that the text passages that we examined included several ties which were crucial and ambiguous. More generally, our data supported our earlier argument, that whether or not a tie is difficult to resolve and important varies with the following: the role that the tie plays in the text; the topical development that has been and is occurring; the reader's familiarity with the content being presented and other idiosyncratic characteristics of text, context, and reader. If we were to offer any recommendation based upon our data to textbook authors, it would be to establish more clearly the topic being discussed, expecially if that topic is unfamiliar. Authors should recognize that the use of pronominalization, synonymy and other forms of reference may cause problems for the reader if the reader is not familiar with concepts presented and is, at the same time, presented with text densely ladened with new ideas.

Topic Continuity

Our second probe was directed at examining another aspect of coherence--topic continuity. Our desire to examine continuity coincided with our interest in the development of arguments, themes or topics within text as well as our concern that there might exist sudden topic shifts disconcerting for many readers. The notion of topic continuity relates directly to descriptions of coherence offered by van Dijk (1977) who suggested that sentences be assigned a topic-comment structure. This approach is similar to Fries' (1978) notion of theme/rheme. In a topic-comment analysis, topic is determined by examining each sentence or independent clause and determining "what it is about." Comment is defined as that part of the sentence or clause that specifies what is unknown or new. Discontinuity occurs when a sentence or independent clause introduces an argument which cannot be subsumed under the same frame of the argument or predicate of a previous topic.

Two questions guided our analysis of topic continuity: Do readers deem the ideational development that unfolds across texts to be continuous? And, are readers' perceptions of continuity related to selected text characteristics?

Method

Materials and Procedures. The texts chosen for our topic analysis were six of the eight texts used for the cohesive analysis. These texts were broken down into idea units and presented to 20 students. The students were asked to rate the extent to which ideas presented sequentially and pair-wise were predictable or continuous with respect to topic. As subjects read each new idea unit, they were asked to rate its predictability (from "5", very predicatable to "1", very unpredictable). A sample of the text and rating scale are shown in Tables 3.17 and 3.18.

Table 3.17

TOPIC CONTINUITY

Listed are parts of idea units (sentences or clauses) taken from social studies and biology texts written for high school students. As you read each new idea unit we want you to assess the extent to which you believe each new idea unit was predictable or not. That is, mark the extent to which you were surprised by the topic of each new idea unit. Mark:

5 = very predictable
4 = predictable
3 = only somewhat predictable
2 = unpredictable
1 = very unpredictable

Please use the answer sheet to complete your ratings.

Answer Sheet

Name___________________________________ Rating: First/Second

Passage or first line______________________________________

A
B
C
D
E
F
G
H
I

Table 3.18

RANCHES AND FENCES

By the 1890's the western cattle industry centered in the high plains running through eastern Montana, Wyoming, Colorado, the New Mexico Territory, and western Texas.

A

Most ranchers by now owned their grazing land and fenced it in with barbed wire.

B

Ranches varied in size from about 2,000 to 100,000 acres (about 800 to 40,5000 hectares).

C

To an easterner, accustomed to small farms of a few hundred acres at most, western rances seemed enormous.

D

But the ranches had to be large

E

since each steer required a grazing area of 15 to 75 acres (or about 6 to 30 hectares)

F

depending upon the amount of rainfall and the resulting growth of grass.

G

With the invention of better instruments for drilling into the ground and the improvement of windmills for pumping water,

H

many cattle raisers watered their stock from wells scattered over their ranches.

I

In years of abundant rainfall, cattle rancers might prosper,

J

since their herds could fatten on the natural grasses.

K

But in years of drought they were forced to feed their cattle hay or cottonseed cake,

L

a costly practice which often wiped out their profits.

Rating analysis. To assess the continuity or ideas presented across the passage, the predictability ratings of the students were graphed (see Appendix H). The graphs depict the mean predictability rating (marked with an X) for each idea pair and the range of responses of all subjects to that pair.

To determine whether certain text characteristics were associated with discourse continuity or discontinuity, students were asked to explain the basis for their ratings of the text. That is, students were asked to explain the basis for any assessment of predictability which either rose or dropped at least two categories on the scale across the ideas presented in the text.

Topic-comment analysis. Finally, to support our assessment of what was occurring, the predictability ratings were compared to a topic-comment analysis of each text which was developed from the maps of the texts. The procedures followed for these analyses were as follows. First, a topic/comment list was created for each passage. Topic was determined by examining each sentence or independent clause and determining "What it was about." Comment was that part of the sentence which specified "What was related or described about the topic." The following section from a social studies text serves as an example of this procedure:

Text: (1) By the summer of 1982 the American economy was close to rock bottom. (2) National income had dropped from $81,000,000,000 to $41,000,000,000. (3) The steel industry was working at 22 per cent of capacity. (4) Thousands of business concerns had gone into bankruptcy and thousands of banks had closed their doors.

S#	Topic		Comment
(1)	American economy, 1932	-	was close to rock bottom
(2)	National income	-	had dropped significantly
(3)	Steel industry	-	working at 22% capacity
(4)	Businesses, banks	-	bankrupt, closed

The topic/comment list included all sentences from the text. The next step was to group the topic/comment lists into sub-topics. Similar ideas were chunked together by first determining whether topics were identical or synonymous. When topics could be superordinated under a common category, the comments linked to those topics were examined to see if they too shared similarities. These relationship categories guided this process: description, definition, example, process, cause/effect. In the above example, the four sentences are related--they are all examples of business condition. Thus, a suggested sub-topic emerging from the topic/comment list give above is:

Sub-Topic 1 - Business conditions during Depression, 1982
Sentences 1, 2, 3, 4

Sentences were considered in sequential order. When a topic/comment combination appeared to represent a new topic, it was listed as a new sub-topic. Thus, the amount of sentences contained within sub-topics varied across and within texts.

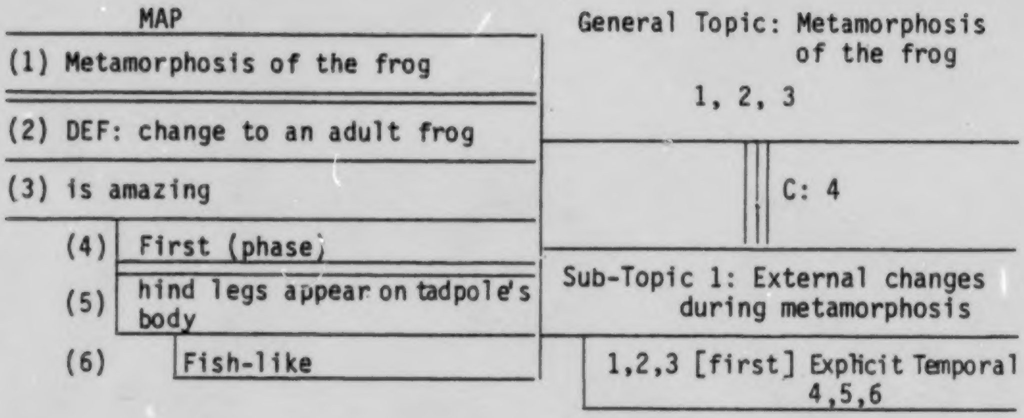
The third step was to chart the sub-topics in a linear representation. In Figure 3.6, the left side represents the mapped version of the text with numbers assigned to each map element. The right side is the chart of topic continuity, with the numbers corresponding to map elements on the left. Connective relationships helped define the scope of topics by providing cues to TYPES of relationships between ideas in the text. Both explicit and implicit connectives were examined. Connective relationships were categorized into the following types: similarity (examples, definitions, clarifications), additive (properties, conditions,), adversative, causal, temporal (simultaneous, precedes, follows, summary). For example, the text reads: "The change to an adult frog is amazing. First, hind legs appear on the tadpole's fish-like body." Use of explicit connective FIRST connects elements 1, 2, and 3 to 4, 5, and 6. The relationship is categorized as being a temporal relationship, describing a sequence of events. Thus, the topic, continuity chart contains a description of whether connections are explicit or implicit, and a classification of the type of relationship which joins the elements.

Results

Do readers deem the ideational development which unfolds across text to be continuous? The predictability ratings provided by the studetns suggested that topic discontinuity manifests itself frequently

Figure 3. 6

Chart of Topic Continuity


MAP
(1) Metamorphosis of the frog
(2) DEF: change to an adult frog
(3) is amazing
(4) First (phase)
(5) hind legs appear on tadpole's body
(6) Fish-like
General Topic: Metamorphosis of the frog
1, 2, 3
C: 4
Sub-Topic 1: External changes during metamorphosis
1,2,3 [first] Explicit Temporal
4,5,6

in text written for high school students. Furthermore, topic continuity or predictability does not occur or change gradually as students progress through a text. Indeed, predictability ratings by students often changed suddenly and these changes occurred at any point of development in the text--beginning, middle or end. Across each of the twenty students who rated the text, there were at least four or five pairs of ideas for which the predictability ratings changed at least two categories (e.g. very predictable to only somewhat predictable) and these points occurred at various points throughout the text.

Are readers' perceptions of continuity related to selected text characteristics? There appeared to be some general and specific text characteristics associated with the students' perceptions of continuity. In general, average means of predictability were lower overall for the biology passages than the history passages. Also, the biology passages appeared to exhibit more variability in the rated predictability of idea pairs.

Comparisons between predictability ratings and the topic continuity charts indicated several interesting findings. In most cases, discontinuity occurred across passages at transitional locations, where topic shifts occurred. Low predictability ratings consistently appeared whenever topics changed, transtions between sub-topics were weak or where no explicit transition existed. For example, consider the following pair of ideas, identified as being not very predictable:

> In male fish, the sex organs are called testes.
> These develop sperm cells.
> When the female lays the eggs,...
> (Taken from #112, Reproduction in Fishes)
>
> Those with fixed incomes, such as college professors,
> were actually better off because prices declined.
> Although the bottom dropped out of the new car
> market, enough people managed to hold on to their
> old ones so that...
> (Taken from #226, Rock Bottom)

Both examples represent situations where an author introduced a new idea whose relationship with what has preceded is not readily apparent.

In other places within texts, what is deemed not very predictable is left almost totally dangling. In the following examples the relationship of the new idea--the last idea presented-- to the text which precedes it is never clarified.

> enough people managed to hold on to their old ones so that the use of gasoline did not decrease. Cigarette prices rose steadily.
> (Taken from #226, Rock Bottom)

In support of these findings, when we asked our students to explain their ratings, the comments offered most frequently echoed our own analyses. For example, among the more frequent responses offered by students were statements such as the following:

> "the text has a problem in logic"
> "the new topic or idea was not set up"
> "author could have gone in a number of directions, need more information prior to new direction"
> "no steps to new ideas"
> "seems unrelated"
> "why this comment, I don't know."

Finally, in our analyses of the text, we were interested in whether or not we might be able to forecast which pairs of idea students would deem predictable or unpredictable. As we have suggested already, points of greatest and least continuity coincided with topic shifts and limited transitions depicted on our maps and topic-comment listings. However, several of the topic shifts that were identified by our analyses were not among those pairs of ideas that students deemed least continuous. Our text analyses suggested that each text contained between three and seven topic shifts that might be rated as relatively less predictable. The students' ratings suggested that the predictability of the texts at these points was not always diminished. As our examples and the comments provided by students partly illustrated, there were several factors which contributed to discontinuity that our analyses did not measure. Still in all, it would seem that a topic-comment analysis together with an examination of the connectives would predict several of the points which were less predictable.

In summary, our findings with respect to topic continuity suggested: 1) topic discontinuity manifests itself frequently in informative text written for high school students; 2) as a group, the biology texts included more topic shifts and more points within the text that students rated as less predictable; 3) discontinuity across passages was detected most frequently at transitional locations, where transitions between topics were either weak or lacking; 4) among the major factors that students suggested as contributing to discontinuity was the authors' failure to set up adequately the presentation of new ideas. Comments offered by students suggested that topic discontinuity would be improved if authors provided additional transitional information or an explanation of their logic.

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PART 5: PATTERNS OF TEXT

Diane L. Schallert, Sarah L. Ulerick, David Lydic

What differentiates text from a list of unrelated sentences is that the sentences of a text somehow cohere together and, as a whole, present an invitation to the reader to construct a pattern of ideas that represents the structure of the author's message. Over the last 15 to 20 years, psychologists have moved to an increasing use of extended text as experimental materials. In describing the stimuli presented to subjects, they have found themselves needing some system for describing the general structure underlying the presentation of ideas. Since most investigators of extended text have used narrative, story-like materials, it is not surprising that the one structural pattern most developed, tested, and critiqued has been story grammar (Mandler & Johnson, 1977; Rumelhart, 1975; Stein & Glenn, 1979). The general explanatory value of story grammar is that it affords the text analyst, and theoretically, the story reader, with a system for identifying the function that any one piece of text is playing and for predicting what kind of information is likely to appear.

Informative text has not so far been formally described with a structural system or grammar of its own. Rhetoriticians have described, or rather, prescribed, major modes of presenting ideas such as the comparison structure, the descriptive structure, and so on. However, these patterns have not been empirically demonstrated either to occur regularly in natural text or to have some important psychological effect on text processing. One notable exception is a report by Niles (1965) in which he suggested that all writing has some kind of organization or structure -- even though the structure may be a deliberate lack of structure. He proposed further that organizational patterns emerge in various forms and combinations and may be a key to distinguishing not only between such superordinate categories as narrative and expository but within them as well. Based on an informal analysis of paragraph structure in secondary level social studies, science and language textbooks, Niles (1965) found the major patterns in order of frequency to be enumerative order (simple listing), time order, cause-effect and comparison-contrast.

Having begun a major investigation of informative text characteristics, we became interested in patterns of text structure. The main impetus for our interest came from the process and product of mapping texts, producing a visual display of the coherent relationships that hold a text together. These displays differ from text to text but do highlight some resemblances that might have remained obscure were it not for the maps. In looking at the maps of our sample of texts taken from naturally produced textbook discourse, we were struck not so much by invariant, recurring patterns but by the hybrid combinations of relationships that held at different levels of embeddedness. Furthermore, our sample of texts seemed to range from relatively pure and simple patterns to more complex combinations involving less predictable patterns of text.

To test our intuitive evaluation, we devised a categorization task that instructed subjects to group together maps (and texts) that seemed similar in terms of overall structure. The groupings were submitted to a cluster analysis. In addition, the subjects were asked to rate how similar each map was to their idea of the general pure pattern denoted by four labels, "description," "comparison," "chronology," "causal description."

Method

Subjects

The sixteen participants were divided into two groups. The expert group was comprised of seven graduate students, research assistants and one experimenter (DLS) who had extensive training in mapping. The non-expert group was composed of nine graduate students who had participated in one seminar session on mapping as part of a graduate course on discourse analysis.

Materials and Procedure

The participants worked privately and at their own pace in two sessions. At the first session, the non-expert group received a quick refresher of mapping along with a summary of the symbols and their meaning. They (as well as the expert group) received copies of the 30 maps that comprise our text sample (see Appendix D) along with instructions to:

> "Categorize the maps into groups that reflect any structural similarities that you perceive. We are interested in similarities in the broad organization of ideas. We are not interested in grouping based upon superficial similarities such as subject matter, details of wording, quality of xerox, size of map, etc.

> There is no correct or incorrect way of grouping the maps. The only guideline is that there be at least 2 groups and no more than 10 groups."

The procedure of grouping the maps took anywhere from 30 to 90 minutes. Once the students had formed their groups they were asked to provide a label or a rationale for the groups.

The second procedure was derived from the first and was administered to the same subjects, 7 to 10 days following the first procedure. Based upon an informal analysis of the grouping offered by the participants above, four major categories were detected. Three of these were easily labeled by two experimenters working independently as representing description, comparison, and chronology or process. The fourth grouping, was slightly more difficult to label. Concepts were presented and a number of medium and low level causal relationships appeared in this group. We eventually agreed on the label, "causal description of concepts."

When the participants appeared for the second procedure, they again received the 30 maps (randomly ordered) and the following rating instructions:

> The first time we had you look at these maps, we asked you to group them in terms of structural similarity. We have looked at your groupings and have arrived at the following four main categories:
>
> category 1: Description of Concepts About a Topic
> category 2: Comparative Organization
> category 3: Chronological Organization
> category 4: Causal Description of Concepts
>
> Some maps may seem to fit exactly one category. Some may be good examples of two or more categories. And some may not seem to fit into any category very well.
>
> Your task now is to take each map and rate how close it comes to representing as a whole the structure implied by each category. Your ratings should not merely reflect the proportions of relationships implied by the category labels. For example, the degree to which a map fits into the "Causal Description of Concepts" category is not necessarily determined by the proportion of causal relationships shown in the map. Rather, in doing your ratings, try to 1) view each map as a structured whole, 2) compare each map with what you would see as an "idealized" example of each of the four categories, and 3) rate the similarity between the real map and idealized categories.

The ratings were based on a six-point scale with 1 = "a perfect match," 2 = "quite similar," 3 = "somewhat similar," 4 = "somewhat different," 5 = "quite different," and 6 = "not at all similar." Ratings were marked on grids that listed the texts on the left side and gave the four category labels in columns next to each text.

Results

To score the participants' categorizations of the maps, a 30 (texts) by 30 grid was constructed, yielding cells defined by one text on the horizontal and one on the vertical. Tallies were entered for each subject in every cell that represented two texts placed together in the same category. The cell frequencies were then turned into two proportions: (1) the proportion of experts (denominator = 7) that had placed the cell's two texts together; and (2) the proportion of all participants (denominator = 16) that were represented in that cell. These proportions were entered separately into multidimensional scaling analyses and a four-factor solution was found. These solutions have not been explored further, at this time.

The proportion scores can also be visually inspected. In Table 3.18, we list the proportions of experts and of the total sample who paired a particular text with another. The table is organized text by text and the order of entries under each text is determined by the relative strength of association with other texts. In listing associated texts, a cut-off score of .35 was used. A text is listed if at least one of its associated proportions in more than .35.

Some characteristics of the categorization proportions should be noted. First, every text is grouped with at least one other text, indicating that none of our texts were perceived as truly unique. Second, the strength of association varies dramatically from text to text. For example, Text #101 has expert proportion scores of .85 with Text #102 and #222; Text #106 does not have any proportion score higher than .42. Third, some texts are associated with many others (e.g., Text #103) whereas others have relatively few associates (e.g., Text #106). Fourth, experts and non-experts generally agree at least as to the order of any text's associates, although occasionally there is a wide disparity (e.g., Text #225).

Table 3.18

Proportions of Concurrence for Pairs of Texts

Derived for Mapping Experts and for All Ss

Text #	Prop.of Experts	Prop.of All
TEXT # 101		
222	.85	.75
102	.85	.56
104	.71	.50
112	.71	.43
223	.42	.43
228	.42	.43
TEXT # 102		
222	1.00	.63
101	.85	.56
104	.85	.56
112	.57	.56
228	.57	.56
223	.28	.37
TEXT # 103		
226	.85	.63
111	.57	.56
229	.57	.43
218	.57	.24
110	.42	.56
227	.42	.43
108	.42	.43
219	.42	.31
105	.42	.31
109	.42	.24
116	.28	.37
TEXT # 104		
102	.85	.56
222	.85	.50
112	.71	.69
228	.71	.63
223	.42	.43
TEXT # 105		
108	.71	.43
230	.57	.37
110	.57	.31
114	.42	.37
221	.42	.24
227	.42	.18
TEXT # 106		
107	.42	.37
221	.42	.37
225	.42	.37
219	.42	.31
TEXT # 107		
220	.57	.56
219	.57	.43
116	.57	.43
106	.42	.37
TEXT # 108		
105	.71	.43
227	.57	.31
114	.42	.63
103	.42	.43
113	.42	.31
229	.14	.57
TEXT # 109		
218	.57	.43
115	.42	.50
217	.42	.37
226	.42	.24
103	.42	.24
112	.42	.24
114	.28	.37
229	.28	.37
TEXT #110		
221	.57	.37
105	.57	.31
103	.42	.56
223	.42	.37
218	.42	.31
230	.42	.24
228	.42	.18
116	.28	.43
226	.28	.37

Table 3.18 (continued)

TEXT # 111

Text #	Prop.of Experts	Prop.of All
219	.71	.37
103	.57	.56
226	.42	.37
109	.42	.24
227	.28	.37

TEXT # 112

Text #	Prop.of Experts	Prop.of All
104	.71	.69
101	.71	.43
222	.71	.37
102	.57	.56
228	.42	.43
227	0.00	.37

TEXT # 113

Text #	Prop.of Experts	Prop.of All
115	.71	.50
217	.71	.43
108	.42	.31
224	.28	.43

TEXT # 114

Text #	Prop.of Experts	Prop.of All
224	.57	.37
227	.57	.24
230	.57	.24
108	.42	.63
105	.42	.37
229	.42	.31
226	.42	.24
221	.42	.24
109	.28	.37

TEXT # 115

Text #	Prop.of Experts	Prop.of All
217	1.00	.69
113	.71	.50
109	.42	.50
224	.28	.37

TEXT # 116

Text #	Prop.of Experts	Prop.of All
107	.57	.43
220	.57	.37
219	.42	.43
110	.28	.43
103	.28	.37
225	.28	.37
226	.14	.43

TEXT # 217

Text #	Prop.of Experts	Prop.of All
115	1.00	.69
113	.71	.43
109	.42	.37
218	.14	.37

TEXT # 218

Text #	Prop.of Experts	Prop.of All
226	.71	.43
111	.71	.37
109	.57	.43
103	.57	.24
227	.42	.24
229	.42	.18
224	.28	.37
217	.14	.37

TEXT # 219

Text #	Prop.of Experts	Prop.of All
107	.57	.43
220	.57	.43
229	.57	.37
226	.42	.56
221	.42	.56
116	.42	.43
110	.42	.31
106	.42	.31
103	.42	.31

TEXT # 220

Text #	Prop.of Experts	Prop.of All
107	.57	.56
219	.57	.43
116	.57	.37
229	.42	.50
225	0.00	.43

TEXT #221

Text #	Prop.of Experts	Prop.of All
223	.71	.63
110	.57	.37
106	.42	.37
219	.42	.31
114	.42	.24
105	.42	.24
228	.28	.50
225	.28	.37
229	.28	.37

Table 3.18 (continued)

TEXT # 222

Text #	Prop.of Experts	Prop.of All
107	.57	.56
219	.57	.43
116	.57	.37
229	.42	.50
225	0.00	.43

TEXT # 223

Text #	Prop.of Experts	Prop.of All
221	.71	.63
228	.57	.56
104	.42	.43
101	.42	.43
110	.42	.37
102	.28	.37

TEXT # 224

Text #	Prop.of Experts	Prop.of All
225	.71	.56
114	.57	.37
230	.42	.24
113	.28	.43
115	.28	.37
218	.28	.37
226	.14	.37

TEXT # 225

Text #	Prop.of Experts	Prop.of All
224	.71	.56
106	.42	.37
116	.28	.37
221	.28	.37
220	0.00	.43

TEXT # 226

Text #	Prop.of Experts	Prop.of All
103	.85	.63
218	.71	.43
229	.71	.37
219	.42	.56
230	.42	.37
111	.42	.37
109	.42	.24
114	.42	.24
110	.28	.37
227	.24	.43
116	.14	.43
224	.14	.37

TEXT # 227

Text #	Prop.of Experts	Prop.of All
226	.57	.43
108	.57	.31
114	.57	.24
103	.42	.43
229	.42	.31
218	.42	.24
105	.42	.18
111	.28	.37

TEXT # 228

Text #	Prop.of Experts	Prop.of All
104	.71	.63
102	.57	.56
223	.57	.56
222	.57	.43
112	.42	.43
101	.42	.43
221	.28	.50

TEXT # 229

Text #	Prop.of Experts	Prop.of All
226	.71	.37
103	.57	.43
219	.57	.37
220	.42	.50
227	.42	.31
114	.42	.31
230	.42	.24
218	.42	.18
221	.28	.37
109	.28	.37
108	.14	.57

TEXT # 230

Text #	Prop.of Experts	Prop.of All
105	.57	.37
114	.57	.24
226	.42	.37
110	.42	.24
224	.42	.24
229	.42	.24

Finally, two major groupings emerged, one composed of Texts #101, 102, 104, 112, 222, and (possibly) 228, and the other composed of Texts #115, 217, and 113. The first grouping involved texts that mainly described a chronology of events. The second involved compare/contrast texts. A third, more weakly associated grouping, involving Texts #103, 111, 218, 226, and possibly 229, seemed to be giving a description of concepts.

Results of the second procedure, in which the participants took each text and rated on a scale from 1 (perfect match) to 6 (not at all similar) how similar it was to their ideal representation of each of four text types, were analyzed. Means and standard deviations were calculated for the experts for the total group (experts and non-experts) separately. In Table 3.19, the codes next to each text should be interpreted as indicating points along the continuum from "perfect match" to "not similar at all." "S" represents a mean rating less than or equal to 2.5 with a standard deviation less than or equal to 1.00; "s" represents a mean rating between 2.5 and 3.5; "n" represents a mean rating between 3.5 and 5.0; and "N" is used for ratings greater than or equal to 5.0 with standard deviations less than or equal to 1.00.

As indicated in Table 3.19, some texts are much more distinctive than others. Texts #105 and 111, for example, are strongly identified as representing descriptions and strongly rated as NOT fitting Categories 3 and 4, with a slightly weaker "no" being given to Category 2. Texts #107, 219, 220, and 223 are rated by the group as a whole as showing a weak descriptive structure in combination with a weak second category, either chronology (3) or causal description (4).

Texts #217 and 115, the two identified as compare/contrast texts as a result of the first procecure, are both rated as showing a strong comparison structure together with a less strong but positive description structure. The "chronology" or process texts identified by procedure 1, Texts #101, 102, 104, 222, yielded strong Category 3 ratings but also strong Category 1 (description) ratings.

Table 3.19

Summary of Similarity Ratings of Texts to Four Major Text Patterns by Mapping Experts and by All Raters

	Experts				All			
TEXT	1	2	3	4	1	2	3	4
101	(S)	(N)	(S)	n	s	(N)	(S)	(N)
102	(S)	(N)	(S)	n	(S)	(N)	s	n
103	(S)	n	(N)	n	(S)	(N)	(N)	n
104	(S)	n	(S)	n	(S)	n	s	n
105	(S)*	n	(N)	(N)	(S)	n	n	(N)
106	(S)	n	n	s	s	n	n	s
107	s	n	n	(S)	s	n	n	s
108	(S)	s	(N)	n	s	s	(N)	n
109	(S)	s	(N)	(N)	(S)	s	(N)	(N)
110	(S)	n	(N)	n	(S)	n	(N)	n
111	(S)*	n	(N)	(N)	(S)	n	(N)	(N)
112	(S)	n	s	n	(S)	(N)	(S)	(N)
113	s	(S)	(N)	(N)	s	s	(N)	(N)
114	(S)	(S)	n	n	s	s	n	n
115	s	(S)	(N)	s	s	(S)	n	n
116	(S)	n	(N)	s	s	n	(N)	n
217	s	(S)	(N)	n	s/n	(S)	(N)	(N)
218	s	s	(N)	n	s	s	(N)	n
219	s	n	(N)	s	s	n	n	s
220	s	n	n	s	s	n	n	s
221	(S)	(N)	s	n	s	(N)	s	n
222	s	(N)	(S)	n	n	n	(S)	n
223	(S)	n	s	n	s	n	s	n
224	(S)	s	(N)	n	(S)	s	n	n
225	s	n	n	n	s	n	(N)	n
226	(S)	n	(N)	n	(S)	n	n	n
227	(S)	n	n	n	(S)	(N)	n	n
228	s	(N)	s	n	s	(N)	s	n
229	(S)	(N)	s	(S)	s	n	n	s
230	(S)	n	s	n	(S)	n	n	n

* Received a mean rating of 1.00, perfect match.

1= Description; 2= Comparison; 3= Chronology; 4= Causal Description (S) = mean rating ≤ 2.5 with s.d. ≤1.00, very similar; s = mean rating >2.5 but <3.5, similar; n = mean rating > 3.5 but <5, not similar; (N) = mean rating ≥ 5 with s.d. ≤ 1.00, not at all similar.

Discussion

Results were in line with our original prediction that some texts would show clear, simple patterns of ideas while others would be hybrids and/or unclear combinations of many structural relationships. Thus, the concept of text types might best be viewed as "text-typedness", replacing a categorical system with a continuum.

It remains to be established whether learners would be affected significantly by degree of clarity of text structure. It is our plan to take the recall data from the high school students (Section III.3) to test the hypothesis that learners find it easier to learn from texts that have clear, simple patterns.

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IV

Text Analytic Procedures: Validations and Criticisms

The use of text analysis procedures (see Tierney and Mosenthal, 1982 for a description of different procedures) has been integral to the pursuit of several of the goals associated with our project. In using different procedures we have tried to maintain a critical eye toward what might be uses and misuses of any procedure as well as validation of any method enlisted. Although we view text analysis procedures as providing the means for systematic examinations of characteristics of text and their differential influence upon comprehension, we are also aware that any one procedure does not afford a description of every text characteristic, across every text, across every reading situation. The products and categories that flow from different methods of text analysis must be evaluated with a clear idea of what is being measured, the context within which things are being measured, the reliability with which features can be discerned, and those aspects of text eluding analysis.

Throughout the project, the review, development, use, validation and recognition of the power and limitations of different text analysis procedures prompted a number of papers. For this report, we include one that is related directly to the project and two that are more general reflections of how we have come to view text analysis. It should be noted that these last two papers have been published or submitted for publication elsewhere under the authorships indicated.

Reference

Tierney, R.J. and Mosenthal, J. Discourse comprehension and production: analyzing text structure and cohesion. In J. Langer and M.T. Smith-Burke (eds.). Reader meets author/bridging the gap. Newark, Delaware: International Reading Association, 1982, pp. 55-104.

PART I: THE PSYCHOLOGICAL REALITY OF THE CONCEPT OF EMBEDDEDNESS

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One common characteristic of techniques of text description is that they yield a measure of the relative importance of text units. This is true of formal systems such as Kintsch's (1974; Kintsch and van Dijk, 1978; Turner and Greene, 1977) and Meyer's (1975), as well as more informal ratings that directly assess the importance of units (e.g., Pichert and Anderson, 1977; Johnson, 1970). There are two reasons why researchers interested in how readers process text materials have considered importance as a factor in text research. The first is related to an obvious feature of subjects' memory for extended discourse, its selective imperfection. When dealing with text, readers demonstrate a tendency to focus on some of the ideas presented by an author and to ignore others. Faced with this phenomenon, researchers have been reluctant to treat as equivalent the performance of subjects who select a few ideas that are critical and essential with that of subjects who seem to be reporting ideas as if randomly selecting from a list of isolated items. In response to this need, text description systems have been developed that identify those ideas that text analysts or raters deem as most important in text. One ubiquitous finding has been that readers are more likely to remember, and to include in their summaries information identified independently as being more important.

The second reason why importance has been of interest is that it is very much related to, and is in fact the psychologist's equivalent of, what teachers and curriculum materials call the "main point" of text materials. Educators often express a concern that students will not be able to identify the main idea or intent of an author's message.

Thus, text description systems generally have some method for identifying the relative importance of ideas presented in text. Our method of text description, relational mapping (described in Section III), yields a measure which we see as closely related to the concept of text importance addressed in the existing literature. Our purpose in this study was to assess the relationship between the psychological variable of importance and the formally derived variable of embeddedness (see Section III).

Method

Subjects

Participants were 100 undergraduate students from an introductory Psychology course who participated in fulfillment of a course requirement.

Materials

We chose 20 texts (10 History and 10 Biology) from the pool of texts in our original sample. Half of the History and half of the Biology texts were selected because they had been rated as having a relatively clear, unidimensional pattern. We called these the "structured texts" (refer to Appendix D for Texts #103, 105, 110, 111, 113, 217, 222, 225, 226 and 227). Half were chosen because they represented a less clear pattern of ideas and relationships (Texts #104, 106, 107, 114, 115, 218, 219, 220, 223 and 229). These judgments of clarity of text pattern came as a result of the procedure described in Part 5 of Section III.

For each text, the list of relationship propositions was examined to identify the pool of items that represented propositions at a high level in the text (embeddedness ratings of 1 or 2) and propositions at a low level (embeddedness ratings of 3 or more steps from the main topic). Within each of these categories, propositions that were explicitly rendered in the text (explicitness ratings of 1-1-1 across the proposition) and propositions that had any of their parts rated implicit were identified. We then attempted to find three of each of the four possible types of propositions (high/explicit, high/implicit, low/explicit and low/implicit). Where there were more than three propositions in a category, three were randomly chosen. In three of our texts, one category could not be filled because there were not enough propositions of the type needed. Thus, text #107 has only two propositions that are high/implicit; Text #110 has only one low/implicit propositions and Text #111 has only two low/implicit propositions.

The identified propositions of each category were then rewritten as normal English sentences (see Appendix I for the complete set of sentences presented in their rating format). The sentences were listed on a rating sheet each following for a six-point rating scale with "1" identified as "extremely unimportant" and "6" identified as "extremely important."

The 20 texts and their rating sentences were then divided into five groupings of four texts each, comprised of one History structured, one Biology structured, one History unstructured and one Biology unstructured text. Within each grouping, the order of texts was counterbalanced.

Procedure

The rating task was administered to small groups of subjects in several sessions of one hour each. The texts and rating sheets were compiled into single booklets and randomly distributed to the students as they arrived for the experiment. On the first page of the booklet, the following instructions appeared:

> As you are well aware, you never learn everything presented in a unit from one of your textbooks. Some information seems to be more important than other information and receives more of your attention, time and effort. Your task for this study generally involves rating the importance of ideas derived from four excerpts taken from a high school level textbook. In a very real sense, we are calling upon your expertise as a learner and as a user of the English language to help us identify the level of importance of ideas in text.
>
> Specifically, you will read through one excerpt of about 300 words. You will turn immediately to a list of sentences we have written (no more than 12) to represent some of the ideas in the passage. Frequently, the wording of the rating sentences is different from the wording in the text. Try as best as you can to rate the importance of the idea represented in each sentence against the full original text. The ratings are on a 6-point scale, with "1" used to indicate an extremely unimportant idea and "6" used for an extremely important idea. You may refer back to the original text as often as you wish.
>
> Once you have finished the first text and once you have taken a short break (1 to 3 minutes), please go on to the second excerpt and follow exactly the same procedure: read through the whole passage, then read each sentence and rate how important the idea represented in the sentence is in terms of the whole passage. Repeat this same procedure for a third and fourth text. The order of passages is different for each person. Therefore, work at your own pace and with care until you have finished rating all the text.
>
> You may ask questions now or at any point during the task.

The students read the instructions, turned to the first text, read it through, and then completed the rating of the 12 sentences. They then saw instructions that asked them to rest for a few minutes before going on to the second text. They proceeded through all four texts in the same manner at their own pace.

Results

Subjects' ratings of importance were analyzed in a 5 (Lists) X 2 (structured/unstructured text) X 2 (Science/History text) X 2 (High/Low Ideas) X 2 (Explicit/Implicit Ideas) repeated measures design. ANOVA8, a modified version of the UCLA Biomed Program BMDO8V (Marston, 1978) was used for the analysis.

The main effects of Lists and of Topic (History vs. Biology) were not significant. There was a significant main effect for structured vs. unstructured text, F (1,95) = 5.82, $p < .05$. Idea units, as a group, for structured texts were rated as significantly less important ($\bar{x}$ = 3.96) than idea units, as a group, for unstructured texts ($\bar{x}$ = 4.06). There was also a significant main effect for level of idea in a text, F (1,95) = 70.67, $p < .001$. Ideas high in the text structure were rated as significantly more important ($\bar{x}$ = 4.19) than ideas low in the text structure ($\bar{x}$ = 3.84). Finally, the main effect of explicitness was significant, F (1,95) = 50.55, $p < .001$. Ideas stated explicitly in the text ($\bar{x}$ = 3.90) were rated significantly less important than ideas stated implicitly in the text ($\bar{x}$ = 4.12).

A number of significant two-way, three-way and four-way interactions were subsumed by a significant five-way interaction, F (4,95) = 9.72, $p < .001$). Thus, while generally it was true that high-level, explicit ideas derived from unstructured texts were rated as more important than low-level, implicit ones derived from structured texts, the significant five-way interaction indicated that the pattern of importance ratings for each text was unique.

Since we were most interested in testing whether high-level ideas received higher importance ratings than low-level ideas, we undertook x^2 analyses to further explicate the five-way interaction. For each text categorized by whether it was a History or Biology text and by whether it was structured or not, we examined the relative order of means for high-level and low-level ideas within each of the explicit/implicit categories. We found that for History texts, the pattern supporting our hypothesis (high > low) was confirmed in 16 of 20 pairs (10 texts with ideas divided into explicit and implicit categories). One of the exceptions (low > high) occurred in the explicit category and three occurred in the implicit category. The x^2 supporting our prediction was significant, $p < .01$. For the Biology texts, again 16 of the 20 contrasts supported the hypothesis. The four exceptions were distributed evenly between explicit and implicit categories, $x^2 = 7.2$, $p < .01$, and all occurred in structured texts.

Discussion

Results overwhelmingly confirmed our prediction that relationship propositions identified in mapping as closely tied to the main topic of a text would be rated as more important than ideas low (more embedded) in the text structure. This finding was based upon asking a relatively large number of raters (20 per text) to look at a relatively large number of texts (again 20) representing different topics, disciplines and rated degree of clarity of structure. Based upon this finding and results of the learning study described earlier in which high level ideas were more likely to be remembered, we feel confident that relational mapping provides a psychologically relevant representation of what a text author intends a reader to learn from the text.

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PART 2: A CRITICAL LOOK AT MACRO-ANALYSES OF TEXT

Robert J. Tierney and James Mosenthal

The purpose of this paper is to consider the use of certain text analysis systems as a means for providing formal representations of text. Specifically, we look at Meyer's system for formally describing expository texts (Meyer, 1975), and at Thorndyke's grammar for formally describing simple stories (Thorndyke, 1977). These two systems are discussed in relation to van Dijk's notions on macro-structures and macro-operators and their incorporation in a theory of text grammar--a theory which means to allow for the formal representation of any text. It is our argument that text analysis is misapplied when the particular system used claims to formally represent that which is structurally inherent to a text.

The concept of a formal representation of text implies a representation that is rule governed. Such a representation means to formally describe something inherent in the text. This attempt encourages a use and an approach to text structure that treats a text as if it were an absolute. Van Dijk's notion of a text grammar theorizes the legitimacy of formally represented texts while the systems described by Meyer and Thorndyke assume the legitimacy of such representation. Unfortunately, in reading research it is a deceptively satisfying notion to hypothesize a formal description of, or template for, a text which can be used for comparing and evaluating recalls. The fact is, there are problems with the idea of a formal representation of text--at least in so far as macro-analyses are concerned.

Consider a possible formal representation of the plot structure of a simple story proposed by Thorndyke. According to Thorndyke, any story can be generated formally by the categories of the grammar (setting, theme, plot, resolution, etc.) and the rules (never defined explicitly) for generating the plot structure. However, Thorndyke's grammar can be criticized for the arbitrariness with which the grammar's rules are applied to a story. Essentially arbitrary decisions are made concerning the assignment of parts of a story to the categories of the grammar--the decisions are not grammatically determined. In other words, the assignment of parts of a story to a category of the grammar is as much a product of one's world knowledge relative to stories as it is a product of the grammatical description of a story. It could be argued that Thorndyke's grammar is meant only to describe an internalized grammar for stories. However, the idealized description of this grammar, which Thorndyke does mean to describe, still has none of the formal rigor characteristic of the concept of a grammar. In other words, Thorndyke's grammar does not describe any rules or operations, which allow or determine transformations in the grammatical description of a story.

Consider the following text:

> The Garbage Collectors of the Sea
>
> The garbage collectors of the sea are the decomposers. Day and night, ocean plants and animals that die, and the body wastes of living animals, slowly drift down to the sea floor. There is a steady rain of such material that builds up on the sea bottom. This is especially true on the continental shelves, where life is rich. It is less true in the desert regions of the deep ocean.
>
> As on the land, different kinds of bacteria also live in the sea. They attack the remains of dead plants and animal tissue and break it down into nutrients. These nutrients are then taken up by plant and animal plankton alike. Among such nutrients are nitrate, phosphate, manganese, silica, and calcium.
>
> As the nutrients are released, they spread around in the water. But they tend to stay near the bottom until some motion of the water stirs them. As you saw earlier, during those seasons when the water is churned up and mixed, the nutrients are brought up to the surface. They may also be brought up by the upwelling action of deep currents. This is especially so along the west coasts of Africa, South America, and North America. Wherever there are regions of upwelling of nutrients, there are rich "fields" of plant plankton, usually during all seasons of the year.
>
> So nutrients are kept circulating endlessly in the oceans, and are used over and over again by plant plankton and whales alike. When a plant or animal breaks down the sugar-fuel it needs for growth, the energy stored by the sugar is used. Some of it goes into building new body parts and some of it is lost as heat. This is not true of nutrients.

> Nutrients are not "used up" in that way. For a while, oxygen, carbon, calcium, and other nutrients that a plant or animal takes in become part of the plant or animal. But when the animal or plant dies and when it gives off body wastes, the nutrients are returned to the environment and can be used again and again. (Taken from Ginn Science Program, 1975, Intermediate Level C, p. 395-396.)

Applying Meyer's content structure analysis system yields Figure 4. In structure, the underlined terms written in lower case letters represent rhetorical predicates describing the relationship between parts of a text. Such a rhetorical predicate as covariance antecedent/consequent describes a relationship of causality or allowability between parts of the text. Left most entries describe superordinate propositions of the text (macro-propositions). Overall, the content structure means to present a formal representation of that structuring of ideas which is inherent to the text and which determines comprehension of the text.

However, the arbitrariness of the determination of rhetorical predicates and the actual propositions is evident when discussing entries 8-10. These entries, dealing with the topic of nutrients, should appear between entries 6 and 7--subordinate to those entries. But it is apparent from reading the text that entry 8 should appear as a left most entry since the topic of nutrients dominates most of the passage. This is the case although the text itself does not initially prepare for this dominance and does not allow for any formal 'vertical' tie between the left most entries 1 and 8.

This problem of arbitrariness is not just a characteristic of Meyer's and Thorndyke's text analysis systems but it is also characteristic of van Dijk's more formal approach. In his article, "Text grammar and text logic" (1973), van Dijk presents a text logic describing the micro-structure of a text. More recently (van Dijk, 1977a, 1977b), he implies that with macro-operators one can provide a formal proof for a macro-structure of a text. He describes four macro-operations: construction, generalization, integration, and deletion. The extent to which these macro-operations are formal operations is evident from van Dijk's definition of the four operations. Consider the definition of the integration operation:

> Given a sequence of propositions $\Sigma = (p_1, p_2, \ldots, p_n)$, $n \geq 2$, if there is a proposition p_i, such that for each proposition p_j, $V(p_j)$ is either a normal condition, a normal component, or a normal consequence of $V(p_i)$, then we may substitute p_i for Σ. (van Dijk, 1977a, 13)

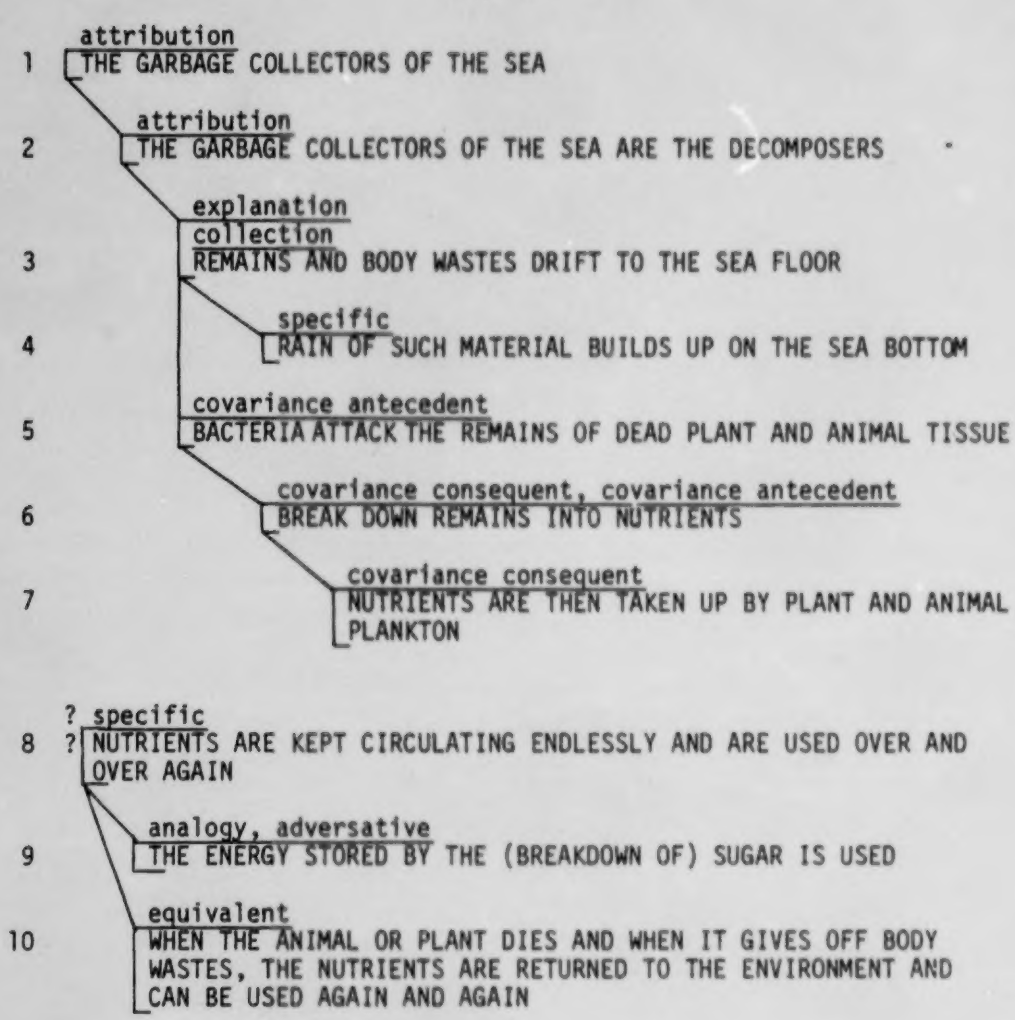
In this definition $V(p_n)$ denotes the fact or truth of p_n relative to the 'world' described by the text. In practice, elements of the formal description of the micro-structure of a text are operated on by the integration operator (or one of the other operators). Through progressive applications of the operators progressively more general levels of a macro-structure are developed.

Consider the informal application of van Dijk's text logic to the first paragraph of 'Garbage Collectors of the Sea.' The micro-structure of this text might consist of the following list of micro-propositions:

1. (there are) garbage collectors of the sea (from the title)
2. the garbage collectors of the sea are the decomposers
3. day and night, ocean plants and animals die
4. and slowly drift down to the sea floor
5. day and night the body wastes of living animals slowly drift to the sea floor
6. there is a steady rain of such material
7. that builds up on the sea bottom
8. this is especially true on the continental shelves
9. where life is rich
10. it is less true in the desert regions of the deep ocean

Such a list could be given for the entire text. If the macro-operators construction, generalization, integration, and deletion are informally applied to the list of micro-propositions the following diagram of a macro-structure for the text might develop:

Figure 4



attribution
1 THE GARBAGE COLLECTORS OF THE SEA

attribution
2 THE GARBAGE COLLECTORS OF THE SEA ARE THE DECOMPOSERS

explanation
collection
3 REMAINS AND BODY WASTES DRIFT TO THE SEA FLOOR

specific
4 RAIN OF SUCH MATERIAL BUILDS UP ON THE SEA BOTTOM

covariance antecedent
5 BACTERIA ATTACK THE REMAINS OF DEAD PLANT AND ANIMAL TISSUE

covariance consequent, covariance antecedent
6 BREAK DOWN REMAINS INTO NUTRIENTS

covariance consequent
7 NUTRIENTS ARE THEN TAKEN UP BY PLANT AND ANIMAL PLANKTON

? specific
8 ? NUTRIENTS ARE KEPT CIRCULATING ENDLESSLY AND ARE USED OVER AND OVER AGAIN

analogy, adversative
9 THE ENERGY STORED BY THE (BREAKDOWN OF) SUGAR IS USED

equivalent
10 WHEN THE ANIMAL OR PLANT DIES AND WHEN IT GIVES OFF BODY WASTES, THE NUTRIENTS ARE RETURNED TO THE ENVIRONMENT AND CAN BE USED AGAIN AND AGAIN

```
          MP1
           |
          MP2
           |
         MP5.1
           |
MP4---MP5---MP6
 |
MP3
```

where the macro-propositions are:

MP1 there are garbage collectors of the sea

MP2 the garbage collectors of the sea are the decomposers

MP3 the remains of ocean plants and animals, and the body wastes of living animals build up on the sea floor

MP4 organic material builds up on the sea floor

MP5.1 the decomposers are the bacteria

MP6 the nutrients are used over and over again

It is apparent that this macro-structure represents a summary of the text. The point of setting up this macro-structure is to indicate that, even with a formally determined micro-structure and the formal application of macro-operators, the arbitrariness of the decisions necessary for the generation of certain macro-propositions such as MP5.0 remains evident. For example, no informal use of macro-operators (assumed or stated) in a macro-analysis of a text, can absolutely determine such a macro-proposition as MP5.1. Yet, the importance of MP5.1 is apparent in the macro-structure diagram. Without it, no tie is made between macro-propositions 1 and 2, and the macro-propositions describing the cycling of nutrients. It is a problem in the macro-analysis of the text that such a strong inference must be made arbitrarily from world knowledge in order to relate explicitly all aspects of the text in the macro-analysis.

Despite the shortcomings of van Dijk's macro-analysis the general notion of a text logic as he proposes would seem legitimate, for the attempt to set up such a logic is a necessary pre-requisite to deriving a resultant macro-structure depicting a formal representation of text. Without macro-operators and a formal micro-structure, the determination of a macro-structure (that which is structurally inherent to a text) would seem an impossibility. In other words without both macro-operators and a micro-structure the claim that the macro-structure of a text is formal and rule governed seems theoretically misconceived. Unfortunately, neither Meyer nor Thorndyke describe formally determined micro-structures or a formal procedure for the macro-analysis of a text. And, in its present form, van Dijk's text logic and macro-operators seem inadequate (see Kiefer, 1977, & Morgan & Sellner, in press, for additional criticism).

With these limitations of macro-analyses in mind, it is appropriate, in the field of reading research, that the goals of text-analysis be re-evaluated--especially such goals as formulated at the National Institute of Education's Conference on Studies in Reading, 1975. In the report of that conference, it was stated that

> a necessary pre-requisite to research on the structural properties of text and their interaction with the processing characteristics of the reader is the development of a linguistic model of discourse structure.
> (NIE Conference on Studies in Reading, 1975)

If it is not an impossible attempt, it is at least, at this time, an inadequate analogy to suppose that the structural properties of texts can be parsed as if they have the structural integrity of a sentence. From a more practical perspective, it is not that macro-analyses of texts are totally inappropriate in experimental research--it is that they are appropriate only as one possible tool reflecting, not defining, processes of text comprehension. In the case of macro-operations, it is best, when dealing with text, to use the concept of macro-operators as descriptors for cognitive processes representing general principles of perception, reasoning, and world knowledge. Researchers intent on using macro-analyses of text should be aware of the theoretical fallibility of their system for analyzing texts. Macro-analyses of text do not, as the systems of Meyer and Thorndyke suggest, describe inherent, absolute structural properties of text. At the very least, researchers should provide their audiences with the actual macro-analyses used and should comment on the generalizability of their macro-models as well as comment on the extent to which they are arbitrarily derived.

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PART 3: BETWEEN THE HORNS OF AN APPLIED DILEMMA: COHESION ANALYSIS IN READING COMPREHENSION RESEARCH

James Mosenthal　Robert J. Tierney

In the present paper, we discuss Halliday and Hasan's (1976) concept of cohesion and its problematic use in reading comprehension research. While this research has been exploratory and its conclusions tentative, there is a certain amount of optimism about the relevance of the concept of cohesion to the applied concerns of reading educators. However, such optimism often leads the reading educator between the horns of a dilemma. The dilemma is one characterized by the opposition between (1) the instructional usefulness of absolute statements about text difficulty and (2) the instructionally unmanageable notions of difficulty defined relative to the individual reader. It is as if one horn of the dilemma held the reader and the other held the text. From the perspective of the reading educator and teacher, the temptation is to steer toward the horn of the text and the apparent security of measurable entities within a text. For the reading educator who wants to be able to tell teachers how to assess effectively the case with which a student of a certain ability will be able to read a given passage, the ability to quantify text variables is seductive. Unfortunately, the dilemma emerges when reading educators examine such quantification against the behavior and responses of individual readers.

Though the dilemma is not new to researchers and educators, it is still unresolved. In Halliday and Hasan's (1976) cohesion concept the dilemma is discovered anew, for the temptation is to view the cohesion concept as a given, quantifiable text variable defining a level of coherence difficulty for texts.

It is with this concern for the applied dilemma that we wish to explore the use of cohesive analysis in reading comprehension research. In the paper we will present Halliday and Hansan's cohesive concept, explore its problematic status as a theory of textual coherence, and discuss reading comprehension based research which has used cohensive analysis. For those among the readers of this article who are interested in text-analytic procedures other than cohesive analysis, the problems which will be represented appear generalizable. In this paper, we recommend that researchers and educators be wary of the dilemma that grows from using text-analytic methods as a way of modeling comprehension rather than as a descriptive tool for use in reading comprehension research.

With due regard to Halliday and Hasan's exposition of the cohesive concept, they are not responsible for the dilemma we depict. In their exposition, cohesive analyses of text are used descriptively. The cohesive concept is not set forth as a model of textual coherence relevant to comprehension in reading acquisition or in the development of reading fluency. However, the cohesive concept, as we relate, is not without its theoretical drawbacks. It is possible that our applied dilemma, when dealing with the cohesive concept, finds it roots in these theoretical seams.

The Cohesion Concept

Cohesive is described by Halliday and Hasan (1976) as a text-bound, linguistic phenomenon. For example, in the sentence

> Wash and core six cooking apples. Put them
> into a fireproof dish (Halliday and Hasan, 1976, 2)

them is a cohesive item presupposing the phrase six cooking apples. Together, the presupposing and presupposed items define a cohesive tie.

There are several types of such ties. There are reference ties where pronouns, usually in one sentence, presuppose some noun or noun phrase in another sentence as in the example above. There are substitution ties where words such as one substitute for and thereby presuppose previous reference to a noun or noun phrase:

> Two books lay on the table. John picked up
> the larger one.

There are ties of ellipsis where the absence of a presupposing item assumes a presupposed item or phrase:

> Have you seen the movie? Yes, I have.
> (seen the movie is presupposed in the second sentence)

There are ties of conjunction where connectives are used to relate sentences:

> The English Bill of Rights is an important document in English history. However, it is second in importance to the Magna Carta.

Finally, there are lexical ties where items are tied either by reiteration:

> The paper is on attribution theory. Actually, the paper criticizes attribution theory.

or collocation, where items have the semantic potential of appearing together in a text:

> We had miserable weather last Saturday. This weekend isn't supposed to be any better.

In Halliday and Hasan the description of the totality of such ties in a text constitutes the text's cohesion--the extent to which a text is internally and formally coherent.

Of importance in this regard is Halliday and Hasan's description of the total coherence of a text:

> A text is a passage of discourse which is coherent in these two regards: it is coherent with respect to the context of situation, and therefore consistent in register; and it is coherent with respect to itself, and therefore cohesive. Neither of these two conditions is sufficient without the other, nor does the one by necessity entail the other . . . the hearer, or reader, reacts to both of these things in his judgment of texture (Halliday and Hasan, 1976, 23).

Elsewhere, Halliday (1973) describes the grammar of a language as a "system of available options" from which "the speaker or writer selects" options--"not in vacua, but in the context of speech situations (Halliday, 1973, 142)." And in more recent work, Halliday (1977) speaking specifically of referential cohesion, states that instances of referential cohesion are "interpretable only when we know who 'she' is, what 'this' is and 'earlier' than what" (Halliday, 1977, 188). The upshot of these statements is that cohesion is thought of by Halliday, when looking across his work, as a means of signalling the relationship between a cohesive item and a concept of person already referred to, but not in any way as a means of creating the relationship. That is, the cohesive items signal that a relationship is to be inferred but does not constitute the inference in the mind of the reader.

However, in Cohesion in English, this point of view is not clearly stated and leads to the problematic, text-bound coherence producing interpretation of the cohesion concept. There are two fronts to the problem: (1) the unfocused description of the function of cohesion in text; and (2) its theoretical inadequacy. With respect to (1), consider the following remarks by Halliday and Hasan concerning cohesive relations:

> The concept of cohesion is set up to account for relations in discourse . . . without the implication that there is some structural unit that is above the sentence. Cohesion refers to the range of possibilities that exist for linking something with what has gone before. Since this linking is achieved through relations in MEANING . . . what is in question is the set of meaning relations which function in this way: the semantic resources which are drawn on for the purpose of creating text. And since . . . it is the sentence which is the pivotal entry here . . . we can interpret cohesion, in practice as the set of semantic resources for linking a SENTENCE with what has gone before (Halliday and Hasan, 1976, 10).

Elsewhere, Halliday and Hasan state that "the concept of cohesion accounts for the essential semantic relations whereby any passage of speech or writing is enabled to function as text" (Halliday and Hasan, 1976, 13). They also state that the cohesive categories "have in common the property of signaling that the interpretation of the passage in question depends on something else" (Halliday and Hasan, 1976, 13).

This description of cohesion is diffuse and confuses the role of cohesion in text. Halliday and Hasan suggest, for example, that cohesion _accounts_ for meaning relations in discourse. Also, it _creates text_ by _linking_ ideas encoded in sentences. Not only does cohesion _account_ and _link_ and _create_, it also _enables_ and _signals_ as well.

It seems that the relations that are meant to exist between ideas communicated in sentences are signaled explicitly in text, according to Halliday and Hasan, primarily through the use of cohesive ties. The key term here is "signal." Cohesive signals represent explicit attempts to signal the relationship between immediately attended information and certain available information. The terms _link_, _create_ and _enable_ tend to present cohesion as a causal or constitutive factor of coherence--coherence is placed in the text for the reader.

This problematic status of the concept of cohesion is also apparent in the discussion of the cohesion categories in _Cohesion in English_. In the discussion, each example of a tie is discussed primarily as a separate phenomenon without any reference to the amount of inferencing required to interpret the individual tie nor the tie as it is complemented by other text properties. Such discussion places a heavy burden on the concept of cohesion in terms of explaining what a text is beyond its individual sentences. As a result, it is tempting to treat cohesion simply as the sum of cohesive ties in a text. In other words, in treating reference, substitution, ellipsis, conjunction, reiteration, and collocation as functionally similar entities defining textual cohesion, the temptation is to think of cohesion in text as an existing, identifiable, macro-entity defining coherence. Such is the perspective from the horn of the text.

With respect to the theoretical inadequacy of the concept of cohesion, Morgan (1978) and Morgan and Sellner (1980) also criticize Halliday and Hasan for portraying cohesion in _Cohesion in English_, as determining coherence for a reader reading the text.

Again, what is problematic is whether cohesion maintains a superordinate/causal or a subordinate/consequential relationship to the comprehension of text.

For Morgan (1978) and Morgan and Sellner (1980), the problem begins when interpreting the alignment of the concepts 'text' and 'cohesion' in Cohesion in English:

> The word TEXT is used in linguistics to refer to any passage, spoken or written, of whatever length, that does form a unified whole . . . This suggests that there are objective factors involved. There must be certain features which are characteristic of texts and not found otherwise (Halliday and Hasan, 1976, 1).

These objective factors turn out to be cohesive ties, and, according to Halliday and Hasan, they are essential characteristics of text. The implication is that objective, cohesive factors determine a text's coherence for a reader. Morgan (1978) and Morgan and Sellner (1980) criticize Halliday and Hasan for this implication and for the general lack of a cognitive component in the description of cohesion. Here, in theoretical terms, is one basis for the applied dilemma.

Morgan (1978) and Morgan and Sellner (1980) base their criticism on a discussion of the cohesive tie connecting them and 6 cooking apples given above. Morgan argues that the assertion of a dependent relation of coherence to cohesion negates a reliance on a cognitive, inferencing component in the comprehension of text. He claims that it is this negation that is at the problematic core of Halliday and Hasan's cohesion concept:

> There is a vicious circularity here. The recipe has cohesion, is a coherent text, just in case them refers to the apples. But we are only justified in inferring that them refers to the apples if we assume that the text is coherent. Thus, in spite of Halliday and Hasan's claim, it is not the anaphoric facts

> that give rise to the inference that _them_ refers to the apples (Morgan, 1978, p. 110).

Morgan's argument is summed up in Morgan and Sellner (1980). Morgan and Sellner criticize Halliday and Hasan for making the mistake to interpreting cohesion as source and cause of a text's coherence rather than as a consequence of it:

> The source of coherence would lie in the content, and the repeated occurrences of certain words [examples of cohesion] would be the _consequence_ of content coherence, not something that was a source of coherence. It would be a serious mistake to construe the linguistic manifestation (i.e., examples of cohesion) as cause, rather than effect. (Morgan and Sellner, 1980, p. 25).

The criticisms Morgan (1978) and Morgan and Sellner (1980) make are not directed at an articulated stance held by Halliday and Hasan. Rather, as Morgan (1978) points out, his criticism is directed at an underlying misconception of the role of a text in communication that surfaces not only in the arguments of Halliday and Hasan, but also in the unspecific terminology used to describe cohesion.

Ultimately, in _Cohesion and English_ Halliday and Hasan diminish the reader's role in constructing meaning in text. Coherence is in the text and in the situation and very little is said about the role of the reader. Such little emphasis given to the reader's ability to make connections and to generate coherence from a registerally consistent and cohesive text works against Halliday and Hasan's description of text coherence. And it is this vacuum which draws the reading educator between the horns of applied dilemma.

The Use of the Concept of Cohesion by Reading Educators

To review, the apparent causal relationship between the cohesion variable and a text's comprehensibility is based on the notion that cohesive ties determine coherence. Thus, if text analysis indicates that a text uses an abundance of cohesive ties, then the text is assumed to be coherent. It is reasoned that the degree to which ideas in a text are related via cohesive ties is the degree to which relations between ideas are understood by a reader. This reasoning is important when considering text analytic procedures in general. The use of these procedures can only become misused when the product of analysis is taken to be a formal representation of _the_ meaning and coherence of the text. Such misuse of text analysis treats the text solely as an object similar to the sentence and capable of being analyzed in a similar manner.

The applied dilemma for the reading educator arises when such text-based reasoning runs counter to reader-based theorizing about the process of text comprehension. For example, for the reading educator interested in a text's readability (and therefore its comprehensibility) a formulaic approach to defining the coherence level of a text is appealing in that it purports to provide a measure of the difficulty of a text in terms of "how well it hangs together." However, from the perspective of the horn of the reader, we are reminded of schema-theoretic positions on reading comprehension that stress the importance of the cognitive abilities of the reader over text characteristics when discussing the reader's comprehension of text. In the discussion that follows all of the arguments and research reported have had to face the dilemma we depict.

For example, Moe (1979) discussed the value of the concept of cohesion. On the horn of text, he took the stance that there are aspects of comprehensibility that are reader independent and that can be measured by the number and type of cohesive ties. As he stated, his position was that a tie:

> bridges sentences semantically [and] enables the reader to establish coherence in text and therefore accounts for a large portion of this comprehensibility in written discourse.

Alternatively, on the horn of the reader, Moe asserted that it is unacceptable to use the cohesion concept to predict the effectiveness of a particular tie. In accordance with this view, he suggested that it is a mistake to equate the cohesion concept with a coherence-producing factor inherent in text.

Irwin (1980) based her work on the notion that readability/comprehensibility is largely defined by the degree to which "sentences are conceptually linked" for and by the reader (1980). She did not restrict herself to cohesion but incorporated it in a set of coherence factors that included coherence between clauses as represented in a text analysis procedure elaborated by Kintsch and van Dijk (1979). Her general position was that a text's coherence--its comprehensibility--was directly related to the explicitness with which the relationships between ideas in text were signaled. In terms of the applied dilemma, Irwin at once speaks in terms of the amount of inferencing the reader is called upon to do, yet still asserts the reality of reader-independent text variables predicting the comprehensibility/readability of a text for a reader.

Thomas and Bridge (1980) seem similarly tempted by the definability and measurability of cohesion. They postulated that it is possible to use cohesion analysis to demonstrate how closely propositions are related according to the number of ties between them. By assuming the power of cohesion to establish coherence, the number of ties between propositions is used to explain why a proposition is generated/recalled most often in a summarizing task. Yet they too discover the power of the reader in concluding from their data that cohesion does not account for comprehension differences between readers.

In her dissertation, Rhodes (1980) clearly represented the inadequacy of working solely from the horn of the text. Rhodes hypothesized that first grade basal texts written with a decoding orientation toward beginning reading instruction would provide passages with "semantic structures" different from basal texts written with a whole-language orientation toward beginning reading instruction. She predicted that these semantic structures would affect students' reading strategies and hence their comprehension of text. Rhodes used two text analysis systems to define a text's semantic structure, Halliday and Hasan's (1976) analysis used to identify and describe links between ideas in a text at a surface text level, and Stein and Glenn's (1978) story grammar analysis used to identify and describe text at a 'deep structure' level. She found that simply counting cohesive ties could not predict reader performance, and that the effectiveness of a tie was not related to its mere presence in a text.

As a final example of a reading study investigating cohesive and concluding against its coherence-producing character, Teddlie (1979) looked at text variables influencing a reader's resolution of anaphoric relationships in text. She used Halliday and Hasan's cohesion analysis to identify anaphoric relations in text, but characterized them as first-stage inferences in the reading process. Thus she asked the general question of the actual psychological importance of anaphoric resolution in the reader's creation of coherent meaning. Of importance in Teddlie's study was the fact that she approached Halliday and Hasan's concept of cohesion as a text analysis system, an efficient means of coding anaphoric relations and enabling their quantification. For Teddlie, cohesion analysis was only a means of identifying, isolating and quantifying anaphoric relations in text and said nothing about the cognitive process of anaphoric resolution. She also found that the cohesion concept did not predict recall of major referents in text.

As is clear in all of these reading studies, it is not the case that cohesion represents a reader-independent text variable predicting and explaining comprehension of text. Rather, a theoretically more appropriate position, stressed by Teddlie, is to view cohesion analysis and text analysis systems in general as bookkeeping systems. In other words, text analysis systems provide a tool for managing texts while investigating questions of reading comprehension--it is not a tool for describing a text's coherence or for explaining reading comprehension.

Two composition studies using the cohesion concept also conclude against its usefulness as a predictor of a text's coherence for a reader. Pritchard (1980) looked at the compositions of good and poor writers in terms of the cohesive ties used. He started out with the assumption that writers not only need to compose well formed sentences, but they need to establish ties between sentences thereby creating coherent text. He interpreted cohesion as a local, measurable, linguistic phenomenon (as defined by Halliday and Hasan) and coherence as a non-measurable reference to a text's degree of connectedness or wholeness. That Pritchard does not speak in terms of how coherently the writer is able to think about his topic, indicates the extent to which he accepts the notion that the cohesive concept is indeed reader (or in this case, writer) independent and constitutive of a text's coherence.

Interestingly, Pritchard found that the greater use of cohesive ties characterized the problem sections (not the more coherent sections) of compositions written by poor writers. He concluded that counting and categorizing cohesive ties (the method of cohesion analysis) is not a measure of how effectively ties are used. In other words, cohesion analysis is not a measure of coherence.

In their cohesion study, Tierney and Mosenthal (1981), like the other researchers mentioned above, started out with the assumption that cohesion in text, as characterized by Halliday and Hasan, might be able to predict and explain much of a reader's comprehension of text. However, they found that cohesion analysis does not predict or determine textual coherence for a reader. After having student writers write on two different topics, with a group of writers familiar with one of the topics, cohesion analysis of the student texts revealed significant differences between texts written on the two different topics, but no difference between familiar and unfamiliar writers writing on a common topic. In other words, in line with the arguments of Morgan (1978) and Morgan and Sellner (1980), they found that it makes more sense to talk of cohesion as a consequence of content coherence and content differences and not as a determinant or even a consequence of coherence differences between writers familiar or unfamiliar with the topic.

Summary and Reappraisal

It is our thesis that reading educators are on the horns of an applied dilemma. This dilemma manifests itself in conjunction with the seductiveness of Halliday and Hasan's presentation of cohesion and the faulty argumentation it prompts. The faulty argument runs as follows: (1) the notion of cohesion in text is defined linguistically in terms of instances of reference, substitution, ellipsis, conjunction, reiteration, and collocation; (2) by definition, anything about a text that is cohesive is attributable to the use of these cohesive ties; (3) cohesion is by definition the sum of these ties; and (4) this quantifiable feature of text is causally related to a text's coherence for a reader. For reading education research, this is a very appealing argument since it means that a text's coherence level is identifiable, and reader performance can be assessed/predicted based on a kind of coherence coefficient for a text. But as Morgan points out, this argument is problematic. Rather, in a text, if term X_2 is used to refer to the same concept Y as is term X_1, this intent is fulfilled because a reader comprehends or infers that X_2 is the presupposing item and X_1 the presupposed item in a cohesive tie. It is not the case that a cohesive tie constitutes the 'tie' in the mind of the reader.

Tierney and Mosenthal (1981) and Tierney, Mosenthal and Kantor (1980) conclude, in reviewing and reappraising text-analysis systems, that from an applied point of view it is best to assert the value of the cohesion concept in singling out individual items--anaphoric items, connectives, lexically cohesive items, etc.--as possible sources of ambiguity for the reader (not sources of coherence). From this perspective there is not a total cohesion effect for a text but individual instances, exhaustively identified by a text analysis system, where ambiguous instances of cohesion might detract from the local coherence of the text at the point where the cohesive item is encountered.

Such suggestions can be used by the classroom teacher. These suggestions minimize the importance of a coherence coefficient and instead aim to help the classroom teacher be more aware of possible sources of ambiguity for a reader. Indeed, at the classroom level, it is suggested that it is not the text analysis systems that are important, but an awareness of text characteristics that can help in identifying ambiguous areas in text affecting reader interpretation. Perhaps from this perspective, our dilemma will become a cautious appreciation of the conflicting, narrow imperatives posed by either horn, the text and the reader, when considered in isolation.

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V

Reader Characteristics

Our discussion so far in this report has been concerned with describing text language and identifying factors that contribute to its comprehensibility. The primary method of selecting text features that are relevant in making a text comprehensible has been recall. As described in Part 3 of Section III, we asked students to learn text samples taken from their textbooks. In analyzing the data generated by comparing what students remembered from the texts with what we determined the author intended for them to learn, we averaged across students for any one idea presented in a text and used text units as the replication factor. Thus our findings reported in Section III.3 are generalizable to other text units from the same population we identified. However, the results still need to be confirmed by analyzing the data with subjects as the replication factor and individual subject's scores generated by averaging across text units of any one type.

In this section, we present two reports in which "subjects" is the replication factor. In Part I, we summarize the results of our attempts to test the influence of reader characteristics (gender and course topic) on recall, identification of main ideas and metacognition ratings. In Part II, we report results of a study in which relational mapping was used to describe college-level Geology discourse and students' response to that instructional setting was assessed.

PART I. INDIVIDUAL DIFFERENCES IN LEARNING FROM BIOLOGY AND HISTORY TEXTS

Diane L. Schallert, Diane M. Estes, Sarah L. Ulerick, Robert J. Tierney

In considering the influence of reader characteristics on how "learnable" textbook language is, we were interested in whether men and women students would respond differently to History and Biology samples. As argued in our proposal, it seemed reasonable to predict that gender differences would show up when looking at texts from two topics, one (Biology) identified as a science and likely to be favored by men students, the other (History) more neutral in its connection with either sex. We proceeded by taking the data generated from the procedure described in Section III.2 and III.3 as the basis of our reader analyses. In the earlier section, we have described only the recall data, and have used only text units as the replication factor. Those data involve an amazingly large and complex set of points and, since one additional purpose of the by-subjects analysis reported here was to confirm the by-text unit analysis, we determined that we would reduce the complexity of the data base by looking at only some of the texts and some of the students' responses to those texts. Thus we report a test of the gender and topic factors for recall, main idea identification, and metacognition measures taken from 12 of the 30 texts in the original sample.

Method

Subjects

The data analyzed and reported in this section were provided by a sub-sample of the subjects described in Section III.2. These subjects were students in six different classrooms in central Illinois. There were 57 students enrolled in high school level introductory Biology, 23 men and 34 women, and 71 students in American History classes, 46 men and 25 women.

Materials

Six History texts were represented (Texts #219, 222, 223, 226, 227 and 228, see Appendix D) and six Biology texts (Texts #101, 103, 106, 107, 110 and 112). The recall data were generated by asking students to:

> Please write down in as much detail as you can the information you have just read. Don't worry about spelling and grammar. Do the best you can in writing down everything you remember.

The main idea identification involved presenting students with the following instructions:

> Below we have listed eight statements that represent ideas from the section you read. Read through all of them and then choose the three (3) most important ideas that represent the main points of the text. Indicate your choice by circling the number in front of the statements. CHOOSE ONLY THREE.

The statements reflected our judgment of what the main point(s) of a text was and usually coincided with ideas high in the map of the text.

The metacognition measures used in these reader analyses involved responses to the first and second rating tasks.

First rating:

Before you have a chance to read the passage, predict how well you believe you will understand the following section which is taken from your textbook for this class. Circle the appropriate number.

1	2	3	4
very well	well	not well	not very well at all

Second rating:

Do you believe you understood the section you just read? Circle the appropriate number.

1	2	3	4
very well	well	not well	not very well at all

Procedure

As described in more detail in Section III.3, the students followed a sequence of steps as they responded to text samples taken from their textbooks: (1) they read introductory instructions; (2) they were asked to predict how well they thought they would understand an excerpt from the textbook; (3) they read and learned a sample text (self-paced); (4) they rated how well they had understood the text; (5) they generated a free recall; (6) they answered short-answer questions about the text;[1] (7) they selected the three most important ideas from a list of 8 statements generated from the text; and (8) they rated how well they had done on the three measures of their understanding of the text. These eight steps were presented three times to the students, once in a quick run-through with a practice text and then again with two of the 30 texts in our sample. For purposes of the analyses reported in this section, only the responses to the first of the two "real" texts were used.

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[1] Responses to these questions were never analyzed. We decided after gathering the measure, that the questions we had asked were not well formulated.

Results

Recall

The text description that is the basis of scoring, identified as the list of relationship proportions in relational mapping, together with the details of the scoring procedure are reported in Section III.3. For purposes of these analyses, proportions were calculated for each subject representing the extent of high-level (1 or 2 embeddedness levels) and low-level (3 or more embeddedness levels) recall he or she generated. These proportions were calculated for Alls (whole proposition scores) and for Parts (any part -- concepts or relationship -- of any proposition).

The scores were entered into two Gender by Topic (Biology, History) by Level (high, low) analyses of variance. In both analyses, there were significant main effects for Topic and Level, $\underline{p} < .001$. Students produced a greater proportion of whole propositions ($\bar{x} = .34$) and of parts of propositions ($\bar{x} = .36$) when learning Biology texts than when learning History texts ($\bar{x} = .22$ and $.26$, respectively). They also produced a greater proportion of the high-level propositions ($\bar{x} = .31$) and of the parts from high-level propositions ($\bar{x} = .34$) than from low-level propositions ($\bar{x} = .25$ and $.28$). Gender was not a significant factor and neither were any of the interactions.

Main Idea Identification

The eight statements on main idea measure were assigned to either a correct (major point) or incorrect (minor point) category. Subjects' choices were then compared to the categorized list and scores determined by counting the number of main ideas chosen (maximum score = 3). These scores were then entered into a Gender by Topic (Biology, History) analysis of variance.

The only statistical significance was found for Topic with a mean of 2.04 for Biology and a mean of 2.45 for History, $\underline{p} < .002$. Men and women students did not differ in their ability to select main ideas. Note that all of the means were above 2, indicating that our high school students were able to choose at least two out of three of the main ideas presented in text.

We also calculated the correlations between students' recall scores and main idea identification scores. The correlations were all quite low, ranging from -.28 to .20, and none were significant. Thus, whether students were able to recognize main points from the passage was not related to their ability (and willingness) to produce either high or low-level ideas in their recall.

Metacognition Ratings

Our first analysis involved a Gender by Topic analysis of variance of the responses to the first metacognition measure. We see this measure as reflecting both how well the students estimate they have fared in their previous dealings with the textbook and how confident they are in their ability to handle future encounters with the textbook.

Results indicated a significant interaction, $p < .05$, between the two factors that ran counter to our expectations. Men in Biology classes were less confident of their ability to deal with their text ($\bar{x} = 2.22$) than women ($\bar{x} = 2.03$) while the reverse was true in History classes (men = 2.00; women = 2.32). Note that the low scores on this measure indicate a high degree of confidence (1 = very well, 4 = not very well at all).

Finally, an analysis was performed on students' reponses to the second metacognition rating which appeared immediately after the text and before any of the knowledge measures. Correlations were calculated between the metacognition rating and the level of recall demonstrated for high-level and low-level propositions. Note that here, negative correlations reflect accurate predictions on the part of students of how good their performance would be. Table 5.1 lists the correlation coefficients for the Gender by Topic by Level categories.

Table 5.1

Correlation coefficients between predicted level of and actual recall scores

		Level of Proposition	
Topic	Gender	High	Low
Biology	Men	0.39*	0.39*
	Women	-0.58*	-0.47*
History	Men	-0.31*	0.01
	Women	0.04	-0.42*

*$p < .05$

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Women Biology students were quite accurate in predicting how well they would do in recalling both high-level and low-level ideas. Of the History students, the men were somewhat less but still significantly able to predict recall of high-level ideas and the women were able to predict recall of low-level ideas. The men Biology students, however, showed significant correlations between ratings and performance that were in the opposite direction. Thus when they predicted they would do well, they were likely to do poorly, and vice versa.

Discussion

In summary, then, results indicated that the gender of subjects made no difference when it came to performance. Men and women students did not differ in their ability to recall ideas from textbook samples or to identify main idea statements taken from the samples. Men and women did differ in their confidence ratings of how well they could learn from text samples but the pattern ran counter to colloquial expectations. Women Biology students predicted they would understand their text better than men Biology students and the reverse was true for History students. Finally, the only other comparison that indicated a sex difference was the correlation measures between how well students had understood a text and how well they recalled it. Here, women showed high negative correlations particularly for Biology texts, indicating that their ratings reflected accurately the state of their knowledge.

In terms of topic differences, contrary to expectations, Biology students produced more complete recalls than History students, although generally for both topics performance was relatively low. The reverse was true when it came to recognizing statements as representing main ideas taken from the text. Here, performance was high. The two performance measures, however, were not correlated. One explanation of these results may be that the production (as in recall measures) of ideas required more effort than the recognition of ideas and thus, may involve to a greater degree a free-floating motivational factor that we did not assess.

Finally, results of both performance measures corroborated the by-text-unit analyses reported earlier that indicated high-level ideas as more memorable than low-level ideas.

PART 2: LEARNING FROM INSTRUCTIONAL DISCOURSES IN A COLLEGE GEOLOGY COURSE

Sarah L. Ulerick

College science courses take place in complex instructional settings where related information is conveyed in more than one mode or presentation of instruction. In the geology course studied here, for example, related information was presented in the textbook, the professor's lecture, the laboratory manual, and the laboratory session. Each presentation had its own content and organization from which students extracted and, hopefully, integrated information. The purpose of this study was to examine factors within a complex instructional setting which may influence students' abilities to acquire and integrate information from instructional discourse.

The study borrows the methodological paradigm of discourse comprehension research and regards college geology instruction essentially as learning from discourse. The textbook and lecture portions of an introductory geology course primarily involve students' listening to or reading verbal material. In an observational study of college science laboratory behaviors, Kyle, Penick, and Shymansky (1979) reported that learning from discourse (listening or reading) accounted for an average of 35% of behaviors across five sciences, including geology. In introductory geology laboratory classes, nearly 55% of the students' behaviors were listening or reading. Despite the fact that learning from instructional discourse is a significant aspect of college science learning, very little is known about aspects of discourse which may facilitate students' comprehension and acquisition of knowledge in such settings.

From a congitive view, comprehension occurs when learners, given their particular prior knowledge structures, interact with prose materials, given their particular content structures or organizations (Ausubel, Novak, & Nanesian, 1987; Bransford, 1979). Discourse comprehension researchers have focused variously on one or the other of these factors. In a typical study about the influence of content structures on discourse (e.g., Johnson, 1970;

Meyer, 1975, 1977) subjects would read a brief expository passage and later recall its contents. The subjects' recalls would provide evidence of their knowledge acquisition. The content structure of the passage would have been analyzed by some method of text analysis (see reviews in Meyer, 1975; and Tierney & Mosenthal, 1980) so that elements in subjects' recalls could be related to specific aspects of text structure.

In a complex instructional setting the discourse "passages" are lengthy instructional presentations. In this study the discourses were the textbook chapter, the professor's lecture, and the laboratory manual chapter. The content structures of the three presentations were described by means of relational mapping, described in Section III. The mapping provided a basis for generating quiz questions which, in place of free recall, provided a measure of students' success in acquiring, integrating, and transferring knowledge.

Discourse comprehension researchers have confirmed that certain features of content structures are predictive of recall. Studies in this area have demonstrated that subjects tend to recall more frequently elements or "pieces of information" which are high in text structure; that is, elements which are relatively more important or superordinant (Johnson, 1970; Kintsch & van Dijk, 1978; Meyer, 1975, 1977). Also subjects tend to recall more information from semantically coherent text (Kintsch & Vipond, 1979; Walker & Meyer, 1980). A few researchers (Marshall & Glock, 1978-1979) have also explored the effects on recall attributable to the types of relationships expressed in text and the explicitness or implicitness of the ideas expressed in text. Findings with respect to these latter two factors are not conclusive.

Thus far, the concerns of discourse comprehension researchers have been confined primarily to experimental settings where subjects read and recall brief expository passages. Research has not yet determined whether features of content structure may be recognized in natural instructional discourses; or whether such features actually influence learning outcomes in the classroom. The present study transfers both the concerns and the methodology of discourse comprehension research to the instructional realm of science education research in the hope of expanding our abilities to describe and analyze learning in complex instructional settings. The major research questions were: (1) Do students in an introductory college geology course perform differently on questions of literal knowledge versus integration of knowledge versus transfer of knowledge?;(2) Do content structure features such as content-match, importance, explicitness, or manner of relationship influence students' performance on literal questions?; and (3) Do special task instructions encouraging students to synthesize or integrate knowledge improve their performance on literal, integration, or transfer questions?

Method

Subjects

Subjects were students in a large introductory geology course intended for nonmajors at The University of Texas at Austin. Subjects attended two one-hour lectures and a two-hour laboratory session each week. Of the 314 students in the class, 230 (73%) participated in the study. Due to the design of the research, however, most results represent the performance of a reduced sample of 117 students, randomly drawn from the larger group of participants.

Approximately two-thirds of the group were freshmen and sophomores. About half of the group were majoring in business. The average grade-point of the students for the previous semester was 2.83.

Materials

The materials consisted of three instructional presentations about the topic igneous rocks, and the quiz questions that tested students' acquisition, integration, and transfer of knowledge. A major aim of the research was to describe how information was organized in natural instructional discourses; the steps by which this was achieved are reviewed in "Describing content structures." The nature of the three types of quiz questions and how they were generated are explained under "Generating quiz questions." In order to tie students' performance on particular quiz questions to the instructional discourses and their content structures, the questions were characterized by a number of text-derived features:

content-match, importance, explicitness, and relationship type. The methods, both analytical and empirical, by which these features were determined are described under "Defining text-derived characteristics."

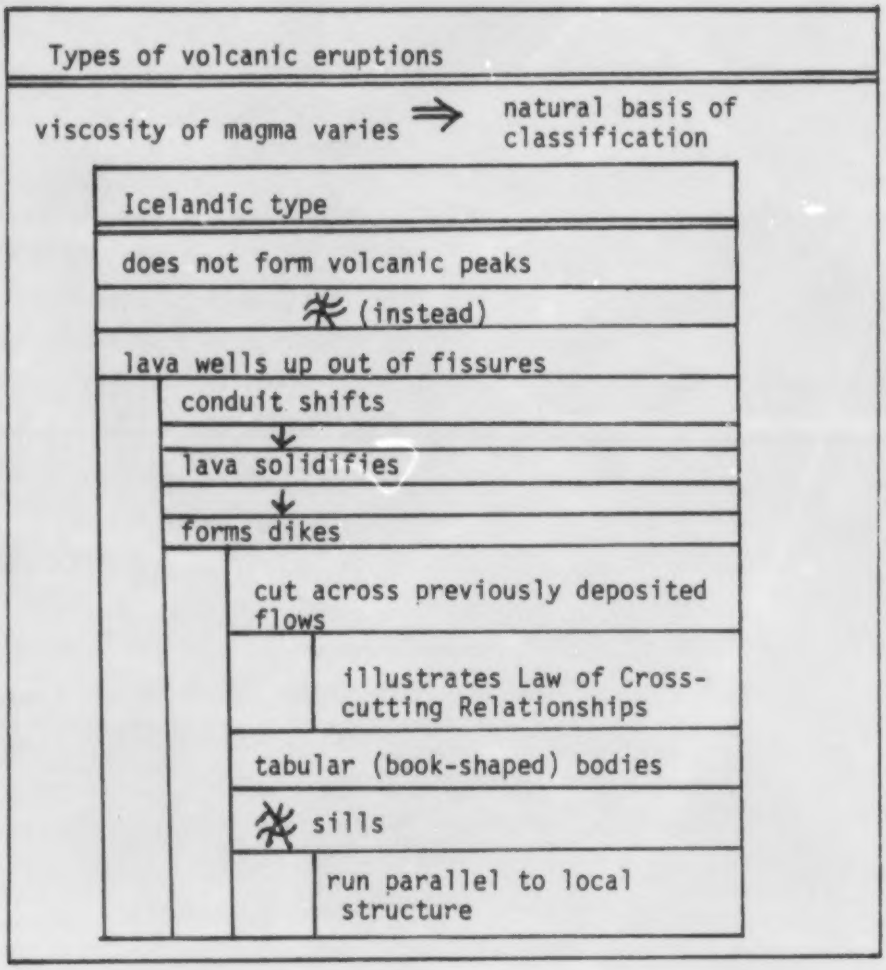
Describing content structures. The instructional presentations about igneous rocks were the textbook chapter (Long, 1974), the professor's lecture and the laboratory manual chapter (Hamblin & Howard , 1980). Content structures were described and analyzed by means of relational mapping.

The instructional discourses were mapped at an overview level. That is, only main ideas of summary concepts and their interrelationships were selected to be mapped. In this way it was possible to produce, for example, a three-page map which summarized the twenty-page chapter from the textbook. A portion of the map of the textbook chapter is shown in Figure 5.1.

From the maps it was readily apparent that related information was presented in each discourse, but with differing emphasis and surrounding information. For example, in the textbook chapter "dikes" were discussed as a feature of Icelandic volcanic eruptions which are extrusive igneous events. In the lecture, however, dikes were contrasted only with batholiths, which were both described as examples of intrusive igneous features. The mapped versions of the discourses clearly illuminated the problem students faced in trying to acquire and integrate related information into a coherent knowledge structure. The maps further served as the basis for identifying topics in common to two or more presentations. The topics provided the content for generating quiz questions.

Generating quiz questions. Three types of quiz questions were composed: literal, integration, and transfer. Literal questions asked about content which was stated completely within one discourse. These corresponded most closely to low-level cognitive questions (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). Integration questions tested students' abilities to tie together information that was related but not explicitly connected in the instructional discourses. Nearly all of the integration questions were linked to specific literal questions that tested premise information.

Figure 5.1


Types of volcanic eruptions
viscosity of magma varies ⇒ natural basis of classification
Icelandic type
does not form volcanic peaks
✱ (instead)
lava wells up out of fissures
conduit shifts
↓
lava solidifies
↓
forms dikes
cut across previously deposited flows
illustrates Law of Cross-cutting Relationships
tabular (book-shaped) bodies
✱ sills
run parallel to local structure

Integration questions were similar to Anderson's (1972) "comprehension" questions. Last, a small number of transfer questions tested students' application of literal and integrated knowledge in new problem situations. A similar usage of the notion of transfer can be found in a study by Mayer and Cook (1981), where transfer questions "required conceptual understanding of several text principles that would be applied to novel problem situations not addressed in the text itself" (p. 103).

Three twenty-question quizzes were constructed, containing a total of 39 literal questions, 15 integration questions, and 6 transfer questions. A few questions were dropped from analysis after administering the quizzes because they had especially low "p" and "R_{pbis}" values on initial item analysis results. The final question sets contained 37 literal questions, 14 integration questions, and 6 transfer questions. Table 5.2 displays two literal questions and the integration question drawn from them.

Defining text-derived characteristics. Literal questions were characterized in terms of four text-derived characteristics: content-match, importance, explicitness, and relationship type. Content-match was defined as the similarity between the superordinate and subordinate concepts and relationships surrounding a given concept or topic found in two or more presentations. Content-match was determined by analyzes of several features derived from the content structure maps: (1) the superordinate relationship which initially introduced a given topic; (2) the approximate "level of embeddedness" or indentation of the topic in the map; (3) the number of subordinate concepts to the topic; and (4) the types of subordinate relationships. Ratings assessed the degree of content-match on a 5-point scale, with "1" being "very similar" and "5" being "very different." Topics which received ratings at the extreme ends of the scale were characterized as either content-same or content-different. The topic "igneous dikes," previously mentioned, represented a content-different topic. Among the literal questions, 18 asked about content-same topics and 19 asked about content-different topics.

Table 5 .2

Two literal questions from a content-different topic and the integration question based on them.

LITERAL QUESTIONS:

Craters differ from calderas in that:

- calderas are much smaller.
- much more fluid lava is erupted from craters than from calderas.
- craters are found on the summit of a volcano, whereas calderas are found only on the flanks.
- craters originate by building up on material, whereas calderas originate by removal and collapse of material.

Crater Lake in Oregon, was formed when:

- the top of a large volcano collapsed, and the resultand hole then filled with water.
- a lava lake like the one in Hawaii cooled and was then covered with water.
- a landslide dammed a river flowing down the mountain, causing the vent crater at the summit to fill with water.
- pyroclastic debris was piled up as high-sided walls around the central vent which then filled with water.

INTEGRATION QUESTION:

Crater Lake, in Oregon, fills a:

- caldera.
- crater.
- fissure.
- lava lake.

Importance and explicitness were determined by seven raters who assessed each questions' content relative to its instructional source. Three of the raters were experts in relational mapping and four were geology graduate students, experts in the subject matter. Each rater had three sets of questions and three presentations to review.

The raters first judged the "presence" of each question's content in the source presentation(s) using a 3-point scale. The content could be explicitly present (3), implicitly present (2), or not present at all (1). Raters were instructed to spend not more than a couple of minutes searching for particular contents. The modal rating of the seven ratings was assigned to the question to determine whether it was explicitly or implicitly stated in the instructional discourse. The majority of literal questions (29) contained explicitly stated content; only 8 questions asked about implicitly stated content.

For those questions rated as present (received a "2" or "3"), the raters next evaluated the relative importance of the question's content. Raters were given these instructions: "This rating should pertain only to how the material was presented--how important did the author intend this content to be? Try not to be influenced by how important you think it should have been presented." A 5-point scale for importance was used with "1" being "very unimportant" and "5" being "very important." A "3" represented the neutral choice of "can't decide." The mean importance rating of the seven ratings was assigned to each literal question. This resulted in only two groups of questions: 14 very important questions and 23 important questions. No question received a mean rating less than "3".

Because the importance ratings assumed great significance in subsequent data analyses, a check on their external validity was also made. A measure of the level of embeddedness of each question's content was determined by examination of the mapped concepts and relationships from which the question was originally drawn. A higher number of levels signified greater embeddedness; that is, a more subordinate concept in the discourse. The mean level of embeddedness was calculated for questions designated as "very important," $\bar{X} = 2.036$, SD = 1.046, and for questions designated as "important," $\bar{X} = 3.369$, SD = .991. A t-test for the difference between the two means resulted in a statistically significant difference, $t(36) = 3.886$, $p < .001$, which corroborated the empirical designations of importance provided by the raters.

The relationship type of each question was determined by analyzing the wording of the question in terms of the recognized relationship types.

Data Collection Procedure

Data collection took place over a span of three weeks early in the the semester. During this time the topic igneous rocks was covered in lecture and laboratory sessions of the geology course. Questions about the instructional presentations were distributed over three quizzes, one following each presentation. Quiz 1 contained only questions drawn from the textbook. Quiz 2 contained questions based on both textbook and lecture presentations. Quiz 3 drew on all presentations and included the six transfer questions. Because students had more knowledge available to integrate as instruction progressed, the proportion of integration questions increased with each testing.

Quiz 1 and Quiz 3 were administered in the lecture sessions. All students, regardless of their participation in the study, took the quizzes because a portion of each was counted toward course credit. Quiz 2 was administered in the laboratory classroom. Half the students in this quiz event received an unrelated vocabulary quiz. This was done in order to check for possible test effects due to the repeated testing of students during the study.

Attached to the second Quiz (both Quiz 2 and the Vocabulary Quiz) was a page describing what students should expect on the final quiz and how they might approach studying for it. These "tasks instructions" were presented in two versions, distributed randomly to approximately equal number of students. The "no integration" version instructed students that Quiz 3 would cover all three presentations on igneous rocks and to "study as you normally would."

In the "integration" version students also were told that all three presentations would be covered; but they were told that the questions would be quite different from previous quizzes. The instructions stated that students would be asked to "synthesize information from these various sources and to solve problems using this information." They were explicitly urged to "try to think how information from each source relates to information from other sources."

Data Analysis Procedures and Preliminary Analyses

With the exception of the factor of task instructions, all of the independent variables of interest in this research were within-subjects factors. The dependent measures in each analysis were the proportions of questions that students correctly answered within specified subsets of questions. The proportion scores were transformed into arcsin values for use in ANOVAS.

Effects of a number of potentially confounding factors were assessed prior to analyzing data which addressed the research questions. These results and their implications are reviewed here briefly.

(1) Cronbach's alpha-coefficients of reliability were determined for the three quizzes: Quiz 1, .61 ($\underline{n}$ = 271); Quiz 2, .62 ($\underline{n}$ = 127); and Quiz 3 .58 ($\underline{n}$ = 253). Reliabilities for multiple-choice tests typically administered in the course over a three-year period averaged .74. Given the diversity of question types asked in the study's quizzes, the quiz data were deemed sufficiently reliable.

(2) Students attended one of two lecture sessions and one of thirteen laboratory sessions. Potential differences in performance due to instructional variation were tested by comparing a number of composite quiz scores. No consistent differences among the groups were confirmed statistically.

(3) Mean scores on Quiz 3 were compared between those students who took Quiz 2 and those who took the unrelated quiz. The two groups did not differ statistically on their total final quiz score or their subscores on literal, integration, or transfer questions from the final quiz. Test effects, therefore, were ruled out as a potentially confounding factor.

Results

Critical Tasks: Question Types

The percentages of questions that students correctly answered in each catgory--literal, integration, and transfer--were calculated for all the quizzes combined. Students' scores for the three types of questions differed significantly, $F(2,232) = 44.59$, $p < .001$. The Newman-Keuls method of post-hoc comparisons revealed that students performed significantly better on the literal questions taken as a group ($\bar{X} = 70.6$), than they did on the knowledge integration questions ($\bar{X} = 56.5$), and the transfer questions ($\bar{X} = 53.9$). Students' performance on the latter two types of questions did not differ significantly.

Nature of Materials: Content Structures

Content-match. Students' percentage scores on the 18 content-same literal questions were compared to their scores on the 19 content-different questions. Students correctly answered a greater proportion of content-same questions ($\bar{X} = 74.5$) than content-different questions ($\bar{X} = 68.7$), $F(1,232) = 8.23$, $p < .01$.

Importance and explicitness. A 2 x 2 ANOVA for repeated measures was used to assess students' performance on literal questions which were grouped by two levels of importance (very important versus important) and two categories of explicitness (explicit versus implicit). The mean proportions of correctly answered questions and the numbers of questions for each group are shown in Table 5.3.

Neither the main effect for explicitness or importance of the questions reached statistical significance, although the effect for explicitness approached significance ($p = .078$). The interaction effect was disordinal and statistically significant $F(1,116) = 5.87$, $p < .05$. When simple main effects were analyzed, students' superior performance on explicit/important questions accounted for the differences observed. For questions classed as explicit, students performed better on questions which were rated important than those rated very important, $F(1,232) = 4.63$, $p < .05$. For questions classed as implicit, importance did not differentiate students' scores.

TABLE 5.3

Scores on Literal Questions Grouped by Importance and Explicitness

Question Group	X%	# of questions
Very Important		
Explicit	69.3	10
Implicit	71.0	4
Important		
Explicit	75.6	19
Implicit	67.5	4

TABLE 5.4

Scores on Literal Questions Grouped by Importance and Relationship Type

Question Group	X%	# of questions
Very Important		
Default	70.3	7
Distinct	68.5	7
Important		
Default	72.6	13
Distinct	76.6	10

For the very important questions, students' scores did not vary by the explicitness of the questions' contents. Among important questions, however, students answered correctly a greater proportion of explicit questions than implicit questions, $F(1,323) = 8.48$, $p < .01$.

Importance and relationship type. The influence of importance and relationship type of question content on students' performance was analyzed in the same manner as that described for importance and explicitness. In this analysis, the literal questions were grouped by the two levels of importance and two groupings of type of relationships (default: property and example versus distinct: definition, comparative, temporal and causal). The mean proportions and numbers of questions in each group are displayed in Table 5.4.

A significant main effect was observed for importance level, $F(1,116) = 13.77$, $p < .001$; but not for relationship type. The interaction of the factors was significant, $F(1,116) = 5.32$, $p < .05$. The main effect for importance held only for questions containing distinct relationship types--definitions, comparisons, or process relationships. For these questions, students performed better on important questions than on very important questions, $F(1,232) = 17.96$, $p < .001$.

Among the questions rated as important, students performed better on distinct questions than they did on default questions, $F(1,232) = 4.10$, $p < .05$. Among questions rated as very important, no statistically significant difference in scores due to relationship type was observed. Students' superior scores on important/distinct questions accounted for the significant contrasts which were found.

Learning Activities: Task Instructions

Performance data from Quiz 3 were used in a 2 x 3 ANOVA, where test-question type was a within-subjects factor with three categories (literal, integration, and transfer) and task instructions was a between-subjects factor with two groups (integration and no-integration). The percentages of questions correctly answered in each category from Quiz 3 were compared for the two groups of students.

A significant main effect was observed only for question type, F(2,448) = 153.16, $p < .001$. Students performed significantly better on literal questions ($X = 87.5$) than on integration and transfer questions; and performed better on integration questions ($\bar{X} = 72.6$) than on transfer questions ($\bar{X} = 54.6$). Neither the main effect for task instructions nor the interation proved to have a statistically significant effect on scores from Quiz 3.

Discussion

When quizzed on information derived from three instructional presentations of the same general topic, students in a large introductory geology class performed best on questions of literal knowledge and performed poorly on questions involving integration or transfer of knowledge. Literal questions represented low-level questions, presumably requiring only retrieval of factual information (Andre, 1979). The students' superior performance on this type of question probably comes as no surprise to college instructors who are aware that students typically encounter low-level, multiple-choice questions on exams in large classes.

The students' performance on literal questions was further analyzed in terms of a number of features derived from the content structures of the instructional presentations. Students responded with proportionately more correct answers to questions drawn from content-same topics than to those drawn from content-different topics. Because both content-same and content-different topics were mentioned in two or more instructional discourses, mere repetition of topic cannot account for the observed difference in performance. Rather, it is suggested that repetition of the informational context of the topics facilitated acquisition and recollection of content-same information. Presentation of content-same information across related instructional discourses may contribute to "instructional coherence" in the same way that use of identical terms or similar context maintains "referential coherence" in brief passages (Kintsch & Vipond, 1979; Walker & Meyer, 1980).

Importance, explicitness, and relationship type interacted to influence students' performance on literal questions. For the particular materials of this study, students performed better on

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literal questions whose contents were rated important when the contents were also explicitly stated in an instructional discourse, or when the questions' contents involved a distinct relationship type. Questions about very important content appeared to have been equally difficult to answer regardless of other text-derived characteristics.

By contrast, students generally performed less well on very important questions which asked about summations or high-level generalities from the instructional discourses. This finding runs counter to the conclusions of most research on the role of importance in discourse comprehension (Johnson, 1970; Kintsch & van Dijk, 1978; Meyer, 1975, 1977). Using measures of free recall, these researchers found that subjects consistently recalled more elements high in text structure than low in text structure.

In these studies elements low in text structure generally corresponded to unimportant or trivial details. In the instructional research reported here, question content was drawn primarily from elements high in text structure, contrasting important from very important content. Despite methodological differences, however, both discourse comprehension research and instructional intuition would predict that students should have been more successful on questions about very important information than on questions about less important information. Two lines of reasoning are proposed to account for the anomalous findings reported here.

The first argument assumes that students learn best what they regard as most important in both experimental passages and natural instructional discourses. The question is how did students determine what was most important. The students' concept of importance-in-instruction apparently did not correspond to the rater's selection of very important content in the instructional discourses. The raters' notion of importance appeared to be based on the generality or superordinance of content and was corroborated by the mapping analysis. This usage is conceptually consistent with importance-in-discourse as determined by analysis of content structures in discourse comprehension research. It is proposed here that the students' notion of importance-in-instruction presumed that material which was most likely to be tested was most important to learn. Students' previous test experiences may have led them to expect low-level questions about specific factual information, and they studied accordingly.

The second line of reasoning assumes that students did not encode preferentially one type of information over another. Instead, their poorer performance on very important questions reflected the slightly greater degree of cognitive processing required to answer such questions compared to specific factual question. It should be remembered that the very important questions were not high-level questions in the sense of requiring integration or transfer of knowledge from several instructional discourses. Their content was simply more inclusive and general than the content of important literal questions.

The only attempt in this study to influence students' learning behaviors was the provision of two versions of task instructions prior to Quiz 3, the final quiz. It was hoped that students receiving the integration instructions would alter their customary expectation of low-level test questions and, consequently, improve their performance on questions requiring integration or transfer of knowledge. The results emphatically demonstrated no effect due to the task instructions.

Any number of events may have mediated between students' receipt of the instructions and their test performance. Students may not have read or understood the instructions; they may have forgotten about them when they studied. They also may not have known how to study for questions which required them to tie together and apply related information. In any case the task instructions, presented only once, were not powerful enough to influence learning activities which might have improved students' performance. This is not to say that task instructions in general are useless; but, the particular statement and delivery of instructions in this study were not sufficient to affect learning outcomes.

Implications

Thus, it was found that students in a fairly typical college science class were shown to perform poorly on questions requiring higher level cognitive processes (integration and transfer). This result should not be attributed solely to the students' "lack of cognitive skills" or to any "inadequacy" of the instructional "treatment." Rather, the interaction of many factors in a complex instructional setting likely produced the observed outcomes. For example, the nature of instructional discourses was shown to affect quiz performances in a predictable manner. Likewise, students' expectations of the criterial task influenced their learning outcomes. This influence was not evidenced by the task instructions provided to students, but can be inferred from the interpretation of students' superior performance on specific factual questions which are typical of exams in large college courses.

In terms of implications to the practice of instruction, these results suggest that providing students with many opportunities to integrate and apply new knowledge in class discussions may be counterproductive if testing requires only low-level knowledge and cognitive skills. Similarly, instructors who forewarn students that synthesis of knowledge will be tested should not be surprised that performance is poor if they have failed to provide meaningful learning activities.

Researchers concerned about classroom learning outcomes may also benefit from acknowledging the real complexity of instructional settings. To this end the methodological tools and paradigm of discourse comprehension research proved useful in describing the content structures of instructional discourses in this study. These methods can and should allow researchers to analyze and describe the nature of instructional "treatments" more fully than has been the practice thus far.

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VI
TEXT-BASED INSTRUCTIONAL STUDIES

Given that certain readers have difficulty dealing with certain text features, there has been a tendency for researchers to subscribe to one of two stands: either pursue instruction that will assist readers with there texts, or develop text in such a way as to avoid such difficulties. Robinson (1961) provides a convincing argument in support of the former stance. He suggests that while textbooks could stand improvement, students given better books will not do much better with them unless they are taught necessary reading skills to use their textbooks.

At the present time, however, research that addresses the domain of meeting the text-based needs of readers is in its infancy. Instructional studies intended to provide students with generalizable strategies for dealing more effectively with text have only scratched the surface with respect to providing educators guidelines that can generalize across sites (Tierney and Cunningham, 1980). Although studies by Bartlett (1978), Dansereau, Holley, and Collins (1980), and Geva (1980) have provided promising data supporting the transfer value of training in text-based strategies, most researchers involved with instructional interventions have had little success. Even those researchers we have cited would probably agree that they have achieved relatively little gain for the instructional energy that was expended. At this time, detailed analyses of instructional success and failure are lacking. Consequently, guidelines for educators intent on meeting the needs of students to deal with their textbooks are more speculative than reasoned from a data base.

With this in mind, we present two separate reports of attempts to develop means of helping students learn from their textbooks. The studies are by no means significantly removed from the studies we cited above in problems inherent in their instructional design. Like much of the previous work testing the effectiveness of strategy instruction, our studies are also more intuitively derived than theoretically prescribed. Still, we believe they represent a beginning that will inform future attempts at identifying ways of helping students help themselves learn from their textbooks.

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PART 1: MAPPING AS AN AID IN HELPING STUDENTS LEARN FROM THEIR TEXTBOOKS

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In the previous sections, we have reported how students typically perform when they encounter instructional discourse. In most of the studies, we attempted to observe naturally-occurring texts being learned in as typical a way as we could arrange within experimental constraints. Here we report on our attempts at training students to improve their strategies for dealing with their textbooks. Since our earlier findings had demonstrated that students have major difficulties learning from their textbooks and in particular, understanding the connections (or relationships) between ideas, we decided to adopt an approach stressing the structure of and relationship between concepts. Mapping, now considered as an instructional aid, became an obvious choice.

The general plan, then, of this study was to train one group of students in mapping samples taken from textbooks and to compare how well they performed on subsequent learning measures with the performance of a control group of students not receiving instruction.

Method

Subjects

One criterion for identifying an appropriate population for this study was that the students be available for a fairly intensive course of training and that the training be perceived by the students as appropriate. After some search, our choice was narrowed down to university freshmen enrolled in a study skills improvement class at Texas A&M University. The course was organized as a 3-hour, 10-section course intended for students who were either on academic probation, had had generally low entrance scores, or who felt they wanted to improve their current methods of studying. We began with approximately 110 students, 90 of whom completed all phases of the study.

Design

The major variable of interest was that of training. Students taking the study-skills course on Mondays, Wednesdays, and Fridays (6 sections) were assigned to the treatment group (n=53). The four Tuesday-Thursday sections became the no-treatment control group. These students (n=37) received no special instruction between the pretest and posttest sessions but attended their regularly scheduled class and instructor.

All participants received a specially designed pretest and posttest that served as the measure of effectiveness of our training. At each testing session, two texts were presented followed by free recall tasks and short-answer tests. In contrast to the first text, students received directions to read and learn the second text using some form of notetaking. At pretest, this was specified as outlining for all students. At posttest, the mapping trained subjects were asked to map the text while the control subjects were again asked to outline. At each test session, one of the texts was a History text and one was a Biology text, the order of topics being counterbalanced across subjects. One final variable appeared in the design in the form of text type. Half of the students in each of the training conditions received at test time "process" texts involving many temporal and/or causal relationships, and half received "descriptive" texts involving mostly properties and examples.

Treatment Procedure

At the first meeting the pretest was administered to all participants. Students in the control groups returned to their regular schedule and instructors for two more class meetings. They then received the posttest on the fourth class day after the beginning of the experiment.

Following the pretest session, students in the MWF sections of the course began training in mapping as a study strategy. On the first day students were introduced to mapping--what it is, how it relates to other study/notetaking strategies, what is can do for a learner. The main relationships used in mapping (property, definition, example, comparatives, temporal and causal) were introduced in a workbook format that students referred to as an instructor explained to the class as a whole. The students were then given exercises to practice the strategy. While they worked on these class exercises, three instructors privately checked their work, and gave further clarification and feedback as needed. A homework assignment was handed out.

On Day two, the relationships and symbols emphasized by mapping were reviewed and the concept of embedding the symbols to describe more than one relationships at a time, and more than one clause or sentence, was introduced. Students again completed in-class exercises and received an assignment to practice what they had learned after class. On Day three of training, students received more experience with even longer (100 to 200 word) passages.

Testing Procedure

Materials. As outlined above, there were two test sessions, a pretest and a posttest session. At each session, each student received two texts and their associated measures. The texts were chosen from our original sample excerpted from high school level Biology and History textbooks (see Section III and Appendix D). Students received either all process texts (2 History: #223 and 228; 2 Biology: #101 and 112) or all descriptive texts (2 History: #226 and 227; 2 Biology: # 103 and 111).

Short-answer questions were developed using the relationship proposition lists as a base. For each text, there were two questions that tested ideas coming from high level/explicit propositions (see Section III.2 and III.3 for operationalization of level and explicitness), two questions for high level/explicit and two for low level/implicit ideas. An example of a high level/explicit question derived from Text #101 is, "When is the tadpole considered a young frog?" An example of a low level/implicit question from the same text is, "How are the lungs formed?"

Sequence of tests. At each test session, the students received two envelopes. They were instructed to empty the first envelope and to begin reading through the materials exactly in the order presented. As they finished each task they put it in the envelope. The sequence for each text was: (1) an instruction sheet asking them to read and learn the following text as well as they can for as long as they need (up to 10 minutes) to understand it well; (2) the text; (3) a metacognitive rating scale asking them to decide how well they understood the passage just read (1="not very well at all", 4="very well"); (4) free recall instructions asking them to write down in as much detail as possible all they remembered of the text; (5) the 8-question short-answer test. Once the students had finished the first packet, they emptied the second envelope and followed the same sequence. The one deviation from the procedure for the first text was that, as part of the instruction to read and learn the text, the students were told to outline as they read (or to map for the mapping group on the posttest) using a blank sheet provided in the booklet. Both testing sessions typically took 40 minutes each, although a few students needed the full 50 minutes of a class session.

Results

Recall

Students' responses to the free recall task were scored using the same procedures described in Section III.3. For purposes of a preliminary look at the data, only scores reflecting students' control of each whole proposition (ALLS) and of just the relationships part were analyzed. Also, only the scores from students in both training condition receiving the process type of text were analyzed, reducing the N to 43 for recall data only.

We tested the effects of training and of the different test points (pretest 1, pretest 2, posttest 1 and posttest 2) and formed no significant differences among the means. The general level of recall was .30 for the whole proposition scores and .34 for the relationship part. For both scores, the lowest mean was registered for the mapping trained group responding to the second text on the posttest, the text where the students were asked to use their newly learned strategy as they read.

There was a significant order by test point interaction attributable to the depressed performance of any sub-group when learning Text #223, The New Deal Farm Program.

Metacognition Rating

The responses to the metacognition rating, 1 = not very well (understood), 4 = very well (understood) were submitted to a four-way analysis of variance with training condition (mapping, control) text type (process, descriptive) test point (pretest, posttest) and text within test point (text 1, text 2 = generate outline or map while learning).

Results indicated that on the whole students were fairly confident they had understood the texts (Grand $\bar{X} = 3.04$). There was a significant difference between the two test points, with ratings obtained at the pretest significantly higher ($\bar{X} = 3.23$) than ratings obtained at posttest ($\bar{X} = 2.85$), $F(1,86) = 40.05$, $p < .001$. Also within test session, students generally felt more confident on the first text ($\bar{X} = 3.19$) than on the second ($\bar{X} = 2.89$), $F(1,86)= 15.32$, $p < .001$. This is interesting, and perhaps puzzling, given that the students worked harder at understanding the second text.

There was a significant two-way interaction between training condition and test point, $F(1,86) = 10.36$, $p < .002$, subsumed by a significant three-way interaction between training condition; text/type type and test point, $F(1,86) = 9.32$, $p < .003$. The interaction could be attributed to the fact that students trained in mapping receiving process texts maintained their initial level of self evaluation from pretest ($\bar{X} = 3.02$) to posttest ($\bar{X} = 3.04$) whereas the mapping trained group receiving descriptive text showed a noticeable drop from pretest ($\bar{X} = 3.12$) to posttest ($\bar{X} = 2.72$). Students in the control group generally began with higher estimates at pretest, with the ratings of those receiving process texts particularly high ($\bar{X} = 3.50$) then dropping precipitiously ($\bar{X} = 2.76$). For the control group reading descritpive texts, the means were 3.28 at pretest and 2.86 at posttest. Thus in the face of a general reduction of confidence in their ability to understand, only students trained in mapping receiving process texts maintained their original estimate.

Short-Answer Test

Students' responses to the short-answer tests were scored on a two-point scale, with scores of "2" assigned to complete and correct answer, "1" to partially correct answers, and "0" to incorrect answers or no response. The highest possible score on any one test was 16.

Scores were submitted to a four-way analysis of variance with the same factors described for metacognition ratings. Students generally performed well on this measure. The grand mean was 10.67, or better than 66% of the total possible score. However, no significant differences between conditions emerged. The means for the treatment conditions fell slightly in favor of the control group and pretest scores were slightly higher than posttest scores.

Discussion

We were generally disappointed in the results of this experiment. Although students seemed to be learning the mapping strategy during training, they did not benefit from training when tested immediately after it ended. Perhaps the strategy had not been learned well enough to be helpful to the students. In fact evidence that mapping interfered with performance is indicated by the fact that it took twice as long for students to learn the text when mapping as compared to when outlining. Yet performance did not improve.

Another possible factor is that, for the population represented in this experiment, other factors besides ability to relate the ideas within a text may have a greater effect on performance. Such factors as motivation, text anxiety, writing ability may serve to mask the potential of training in a strategy that is concentrated on attacking the text language. Indeed, effective study skills programs, such as those of Don Dansereau and Claire Weinstein, include a large component devoted to affective re-training.

Finally, it may have been naive to expect that training that lasts a total of three class periods, that is administered by outsiders and not explicitly reinforced by the students' own teachers, and that requires a relatively intense and effortful processing of text would show a significant effect on an immediate posttest. For all these reasons, we are not willing to "scrap" mapping as a study strategy to be used by advanced students. However, we do feel that the next test of the strategy needs to be more thoughtfully planned.

PART 2: USING TOPIC/SUBTOPICS AS A STRATEGY FOR IMPROVING STUDENT'S TEXT COMPREHENSION

Karen Margolis Samson

Previous analyses of aspects of incoherence in biology texts suggested that many informational texts lack a carefully-developed, integrated sense of continuity. What was found indeed was discontinuity, frequent interruptions in the flow of discourse. Abrupt topic shifts most often contributed to the discontinuity of these texts. Such interruptions may cause some readers to have problems comprehending the gist or main ideas of the text. In an attempt to help readers become better able to cope with text discontinuity, an explicit instructional strategy was developed. The Topic/Subtopic strategy emerged as a practical tool for helping readers identify topic shifts and discriminate between more important and less important ideas represented in expository text.

A two-week instructional study was conducted in which high school biology students were taught to use the strategy. The purpose of the study was to examine the extent to which this instructional intervention improved readers' comprehension of main ideas represented in their biology text.

The Topic/Subtopic strategy is a two-step procedure designed to enable readers to recognize relationships among key ideas in text by engaging readers in the active process of evaluating and synthesizing text segments. Step One of the strategy involves readers in constructing a Topic Comment List (T/C List), requiring them to analyze sentences in terms of TOPIC (what the sentence is about) and COMMENT (what is being said about the topic). Step Two involves readers in grouping Topic/Comment elements according to relationship types in order to create important subtopics suggested by relevant information.

The Topic/Subtopic strategy is a means of channeling readers' attention to relationships between ideas both within and across sentences. It encourages readers to activate background knowledge in classifying relationship types (i.e., example, definition, property, cause/effect, similarity/difference). Since the goal of comprehension in classroom situations (especially with content-area materials) is to grasp essential ideas or gist, the Topic/Subtopic strategy aims at developing this skill. Like mapping, flowcharting, and networking, the strategy (Step Two, identification of subtopics) aims at providing an organized summary of salient ideas of the text. The advantage of this strategy is that it attempts to address process rather than product aspects of text comprehension. During strategy instruction, readers are encouraged to actively participate in explicitly evaluating each sentence of the text in terms of: type of content, type of relationship to other ideas in the text, and relative importance of content to other ideas. The Topic/Subtopic strategy aims at helping readers who may be struggling with a difficult area of text; unlike the global strategies of mapping, flowcharting, and networking, it provides explicit instruction in prerequisite tasks such as locating important ideas, summarizing and condensing information, and discriminating types of relationships.

In teaching this strategy, I was interested in examining the extent to which strategy instruction would affect readers' comprehension of gist information. Comprehension of gist was measured by recall and short-answer questions. Three experimental groups participated in the study: Strategy group, Read-Study group (who practiced reading, studying, then recalling ideas), and the Control group (who had no experimenter intervention).

Based on the premise that the explicit, direct instruction offered by the strategy intervention would promote learning better than mere practice, several predictions were made. First, it was predicted that the explicit strategy instruction would result in greater recall of information than would the practice or non-treatment conditions. Second, it was predicted that the recall of subjects given strategy instruction would contain more important ideas than that of the practice or the non-treatment group. Third, it was predicted that the strategy instruction would result in higher question answer scores than either the practice or the the non-treatment group.

Method

Subjects

The subjects were 61 second semester high school biology students in a rural community, approximately 26 miles outside of Champaign, Illinois. Intact classroom sections were assigned to one of the three conditions (Strategy, Read-Study, Control). All subjects were voluntarily enrolled in biology, all had been instructed by the same teacher prior to the experiment, and all had been taught the same biology curriculum.

Testing Materials and Schedule

Throughout the experiment subjects were asked to read each of several passage, study it (or, in the case of the strategy group, to apply the strategy), produce written recalls of all information, rate the extent to which each passage's content was familiar, and then answer six questions about the content. Four test passages were selected from biology texts and tradebooks. Passages averaged approximately 250 words, with Dale-Chall readability rating averaging 11.0.

Short answer questions to accompany each passage were designed to tap subjects' recall of both explicit and implicit relationships of ideas. These were constructed from an experimenter-created T/C List. Attempts were made to construct questions which required subjects to synthesize information both within sentences and across sentences.

The experimental design consisted of a pre-test, followed by the first phase of the instructional/practice sessions (4 days), then a mid-test, followed by the final phase of the instructional/practice sessions (4 days), then two post-tests, and finally a delayed (time interval: one week) post-test. The testing and instructional plan is summarized in Table 6.

Table 6

Summarization of Testing and Instructional Plan

Groups	1	2	3	4	5	6	7
Strategy n=21	x	Step One	x	Step Two	xx	x	x
Read-Study n=21	x	Practice	x	Practice	xx	x	x
Control n=19	x		x		xx	x	x

Key: 1 = Biology Pre-test Passage 1
2 = Instruction/practice
3 = Mid-test Biology Passage 2
4 = Instruction/Practice
5 = Biology post-test Passage 3 and History post-test Passage 4
6 = Read delayed Biology post-test Passage 5
7 = Test of recall and questions for Passage 5

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Scoring Procedures

Subjects' recall protocols were scored by translating them into propositions, then comparing them to the template text base, and classifying them into types of recall propositions. To capture differences that Kintsch and van Dijk (1978) contend represent different depths of processing, recall was classified into the following categories: text reproductions (lower level of processing), entailments (higher level of processing), and evocations (higher level of processing). These three types of protocol propositions were tabulated for each subject's recall for every test passage, with an interrater agreement of .91 on approximately 10% of the sample. These recall scores provided the raw data for the analysis of recall.

The attempt to measure main ideas or gist involved a comparison between recall protocols and those text base propositions identified as most important. In order to identify what may be judged to be more important propositions represented in the text, advanced biology students and college education majors were asked to rate the text in levels of importance. Propositions were later ranked by order of importance based on these evaluations. The topmost quarter of highly important propositions were determined to be "first important propositions." A more global measure, that of "secondary important propositions," included propositions from both the first and second quarters of ranked propositions. Correspondences between subjects' recall protocols and importance rankings for each set of propositions were examined and entered into the statistical analyses.

Answers to questions were scored by assigning points as follows: 2 points for completely correct answers, 1 point for partially correct answers, 0 points for totally incorrect or blank answers. Total question scores on each passage provided the raw data for analyses of question performance. Interrater agreement on questions was .93 on 10% of the sample.

In addition, a measure of familiarity was included in the study. To determine the extent to which subjects had been familiar with the passage topic prior to reading the passage, subjects were asked to rate their level of familiarity (5 = very familiar, 4 = familiar, 3 = somewhat familiar, 2 = may have heard this once, 1 = never heard it before). Frequencies of each dimension were considered in the analysis of each passage.

Instructional/Practice Materials

Passages used in the instructional program (and for practice with the Read-Study group) were selected from the classroom text. Material was selected with two criteria in mind. First, passages characterizing particular text types (descriptive and compare/contrast) were chosen, due to time restrictions on the experiment. Second, content selections (again due to the limited time framework) was restricted to the material mandated by the school curriculum. To accommodate the classroom biology teacher, instructional and practice passages used in this study were selected from the assigned chapter; thus, all three groups in the study covered the same content during the experiment.

Instructional Program

A total of 61 high school biology students participated in this study. The Strategy groups and Read-Study were each composed of 21 subjects. There were 19 subjects in the Control group.

Strategy Group. There were eight 25-40 minute sessions during which the strategy instruction was implemented. The first four days of instruction were devoted to introducing the Topic/Subtopic strategy and to instructing subjects in Step One of the strategy. Subjects were shown a model of the entire strategy and then led in a series of modeled practice (with discussion) in constructing Topic/Comment Lists. Types of relationships (example, definition, property, cause/effect, similarity/difference) connecting topics and comments were discussed and identified in the practice materials. Cues in the text for determining important information (e.g., first, most of all) were examined. Two passage types, descriptive texts and compare/contrast texts, were used as instructional materials. The flexibility of constructing a T/C List was emphasized through class discussion.

The second half of the 8-day instructional period was devoted to learning Step Two of the strategy and to providing students with some practice in strategy monitoring. In teaching subjects to create appropriate subtopics, the experimenter used a method of modeled practice, feedback, and discussion, like that used to teach Step One. Much attention was given to decisions concerning the general relevancy or importance of various comments. Reasons behind discrimination of important and unimportant subtopics were discussed in detail. Subjects were given practice in applying the entire Topic/Subtopic strategy (Steps One and Two). In an attempt to promote transfer of the strategy and self-monitoring of strategy application, excerpts from various tradebooks, magazines, and assembly manuals were included as part of the instructional materials. These were intended to represent a variety of reading material for which subjects might apply the Topic/Subtopic strategy. Examination of these materials prompted class discussion focusing on when (and if) usage of the strategy would aid comprehension.

Read-Study Group. Subjects in the Read-Study group received no direct instruction in any strategy. The experimenter met with these subjects on five different occasions. During the sessions, subjects received biology passages identical to those used with the Strategy group. Since the Strategy group used a total of five different passages during the instructional implementation, it was necessary that the Read-Study group meet only five sessions. These sessions did not occur consecutively; they were scheduled around the classroom teacher's curriculum plans. With these practice passages, subjects practiced reading the material, studying it for a maximum of five minutes, and then recalling all they could remember. Written recalls were collected and returned the following day. Feedback in the form of points (5 maximum) based on amount of information similar to the original passage was given. These practice activities took a total of 15-20 minutes per session. Subjects resumed regular classroom instruction by the biology teacher when practice activities were over and on days when no practice sessions occurred.

Control Group. Subjects in the Control group continued with regular classroom instruction with their biology teacher. The experimenter attended these sessions. Regular classroom activities, included lectures, class discussions, independent seatwork, and viewing audiovisual materials.

Statistical Analyses

Hierarchical multiple regression was used to analyze the data. This procedure enabled the evaluation of the unique effect of treatment both in isolation and as a function of various status variables. Performance on pre-test Passage 1, reading achievement, biology scores, familiarity, and treatment served as predictor variables in the regressions. In the attempt to capture greater sensitivity to gist comprehension measures, two sets of regressions were performed. Set 1 analyzed data from the following dependent measures: text reproductions, entailments, evocations, and question scores. Set 2 analyzed data from the following dependent measures: first important propositions, secondary important propositions, and total propositions. All two-way interactions and only those three-way interactions of interest were included.

Those variables (reading ability and biology score) that determined the extent to which certain basic abilities accounted for the variance associated with the comprehension measures were entered first into the equation. Next entered were variables that determined the extent to which performance prior to the instructional period was associated with the comprehension measures of the study. These included familiarity and pre-test performance score on the dependent variables being examined.

Treatment variables were entered next into the regression equation. Due to the fact that this statistical procedure limits one to K-1 (i.e., two contrasts [see Cohen & Cohen, 1975]), two major contrasts were examined in this study. To assess the extent to which comprehension of gist information was associated with any treatment, the contrast (labeled T_1) between membership in any treatment condition and membership in a non-treatment conditions (Strategy + Read-Study v. Control) was examined. To assess the extent to which exposure to a particular treatment accounted for various associated with the comprehension measures, the contrast (labeled T_2) between membership in the two treatment groups (Strategy v. Read-Study) was examined.

Hierarchical regression analyses using these sets of variables were performed for the recall and question data on four different test passages. Included were analyses for: mid-test Biology Passage 2, Biology post-test Passage 3, History post-test Passage 4, and delayed Biology post-test Passage 5. All of these testing situations required regression analyses on each of seven dependent measures: recall types (text reproductions, entailments, evocations, first important propositions, secondary important propositions, and total propositions) and question score.

Results and Discussion

Evidence favoring the efficacy of Strategy instruction over Read-Study practice is far from conclusive. Evidence supporting the effectiveness of any of the treatment conditions (Strategy instruction and Read-Study practice) over the non-treatment (Control) condition is equally non-conclusive.

Examining summaries of significant main and interaction effects (see Tables 6.2 and 6.3), it is advisable to mention that on a macro level, of all the analyses performed, three observations restrain considerably any generalizations forwarded: (1) Strategy effectiveness rarely appears as a main effect; (2) significant interactions rarely appear; and (3) occasionally, out of these limited number of interactions, evidence appears favoring the non-treatment condition (Control group).

No strong trends appear in examining data across the biology mid-test, biology post-test, history post-test, and delayed post-test. The appearance of the T_2 contrast as a significant main effect is somewhat supportive of the Strategy effectiveness over Read-Study condition. Furthermore, Strategy instruction is implicated as a facilitative condition (when compared to the Read-Study condition) on measures of secondary important propositions (on both the Biology mid-test and post-test) and question score (on the Biology post-test).

Table 6.2

SUMMARY OF SIGNIFICANT MAIN EFFECTS ON REGRESSION ANALYSES FOR GIST RECALL DEPENDENT MEASURES

Dependent Measures	Mid-Test Passage 2	Biology Post-Test Passage 3	History Post-test Passage 4	Delayed Post-test Passage 5
Text Reproductions	n.s.	**Reading	*Reading	*Reading
Entailments	*Pretest	n.s.	n.s.	n.s.
Evocations	n.s.	n.s.	n.s.	n.s.
First Important Propositions	*Reading	n.s.	n.s.	n.s.
Secondary Important Propositions	*Biology **T_2 (Strategy)	**Reading **Familiarity *T_2 (Strategy)	**Reading *Pretest *Familiarity	*Reading *Pretest
Total Propositions	n.s.	**Reading **Familiarity	*Reading	**Reading
Question Score	*Pretest	*Reading *Biology **T_2 (Strategy)	**Reading	*Biology

*Means Favoring Treatment Conditions at $p < .05$.

**$p < .01$

Table 6.3

SUMMARY OF SIGNIFICANT INTERACTION EFFECTS ON REGRESSION ANALYSES FOR GIST RECALL DEPENDENT MEASURES

Dependent Measures	Mid-Test Passage 2	Biology Post-test Passage 3	History Post-test Passage 4	Delayed Post-test Passage 5
Text Reproductions	*T_1 x Fam x Pretest	n.s.	*T_2 x Pretest *T_2 x Fam *T_1 x Fam *T_1 x Bio x Fam	n.s.
Entailments	*Biol x Fam **T_2 x Biol x Fam *T_2 x Biol x Fam	n.s.	*T_2 x Rdg x Pretest **T_2 x Biol x Fam	n.s.
Evocations	n.s.	n.s.	n.s.	n.s
First Important Propositions	n.s.	**T_2 x Pretest x Fam	**T_2 x Fam *T_1 x Rdg x Biol	n.s.
Secondary Important Propositions	n.s.	n.s.	**T_1 x Fam	*T_2 x Rdg x Biol
Total Prepositions	n.s.	n.s.	**T_2 x Fam	*T_1 x Rdg x Biol
Question Score	n.s.	n.s.	*T_2 x Biol	*T_2 x Rdg x Fam

*Means Favoring Treatment Conditions at $p<.05$
**$p<.01$

In general, results are contextually-specific. The Strategy instruction was perhaps too task-specific, yielding more localized then generalizable effects. The absence of T_1 contrasts suggests that when considered together, the effects of the two treatment conditions are not too different from the effect of the non-treatment condition. The frequency of significant interactions occurring on the history post-test, the subject matter most unlike the instructional materials, suggest the presence of other variables not specifically considered in this study.

What these results suggest is that in this study, as in most classrooms, there are a host of context variables which influence learning (comprehension). What makes these data interesting (though difficult to generalize from) is that there are so many descriptively rich contextually-specific effects. It may be the case that, considering the host of variables represented (e.g., different topics, different passage subject matter), it was not reasonable to expect patterns. Conversely, perhaps there are patterns emerging from the results, but they are obscured, indicating the presence of contextual variables not specifically considered in this study.

Predictions concerning question score were not confirmed. In fact, very few significant effects appeared. On the measures of recall and important ideas, overall results reveal no confirmation of the predictions made. Examinations of tendencies within groups, however, yield valuable description about subjects' recall performance.

The type of recall found least often in performance of the Strategy group was text reproductions. Instead of producing text reproductions, Strategy subjects tended to produce entailments. This suggests that Strategy instruction may have encouraged subjects to draw upcn previous knowledge and background information in synthesizing information (to produce entailments) rather than encouraging the production of verbatim recall (text reproductions). Across all testing passages, more effects for Strategy effectiveness appeared on the history post-test and on the delayed post-test, indicating some transferability of Strategy instructional benefits may have occurred.

The Read-Study condition seemed to facilitate production of text reproductions and entailments. This indicates that, in comparison with the Strategy condition, the Read-Study practice encouraged both verbatim recall and the higher level processing entailments. In comparing the beneficial effects of Strategy instruction with those of Read-Study practice, there appears to be a slightly greater tendency for the Strategy condition to benefit subjects with varying levels of reading ability, biology ability, and topic familiarity.

The type of recall most favored by the Control subjects was text reproductions. This suggests that the non-treatment regular classroom instruction promoted verbatim recall (representing lower levels of processing) rather than entailments (representing higher levels of processing). Results also emerged indicating the effectiveness of the Control condition in promoting recall of important information over that of both the Strategy and the Read-Study conditions. These facilitative effects suggest the possibility that the prevalent teacher-directed discussions observed in the Control condition promoted the recall of important, text-based information.

As an aid for recalling gist information in text, the Topic/Subtopic Strategy does show some potential. It may, for example, prove especially facilitative in helping poorer readers improve their comprehension of text materials. What may be of greater worth regarding results from this study, however, are the implications which may be drawn concerning how instructional research should be pursued. It may be that a heavy-handed, direct instruction approach as well as a "road race" search for results is problematic. The learning which was most exciting was that which occurred at moments during the instructional sequence. These moments were characterized by students discovering the potential for and use of the strategies for their own rather idiosyncratic purposes at the same time as they were struggling for control of the strategy and were quite critical of its worth. It is this struggle and negotiation which appears to be at the heart of strategy acquisition and learning to learn from text. Rather than suggest that the strategy was not suitable for meeting the text-based needs of students, our data and observations support its introduction but in a more indirect,soft-handed way.

VII

TEXT ENGINEERING

Part 1: The Learnability of Ideal Texts Derived From Maps

Diane Schallert Ernest T. Goetz
Michael C. Murphy Robert J. Tierney

One conclusion to be drawn from the results described in Section III is that textbook materials are not always as helpful as they might be. For example, we found that high-level ideas are not explicitly connected to the lower-level ideas in texts, students have problems learning implicit material, topic discontinuity occurred frequently in our sample texts, and structural patterns of ideas in text varied widely in how clearly and simply they were presented. In this section, we tested the hypothesis that the engineering of texts would improve their learnability. Specifically, we predicted that texts would be improved if rewritten using the map as a guide for the underlying structure of ideas. Since the map is an explicit representation of all the ideas and of all their interrelationships needed to make a coherent discussion of a topic, it should serve well as a guide to producing a surface text that comes close to what an author must have intended to say.

In addition, we were interested in the effect of providing students with study guide questions that either did or did not match the underlying overall pattern of ideas in the text (as described in Section III.5). As we mentioned in Section III.2, we found that even texts with a clearly signaled structure could be approached from a different perspective, with a different structure in mind. We were interested in the effect of study-guide questions on what students would learn from text samples. What follows is a brief description of the procedure we implemented to test these ideas. Note that, unfortunately, we have not yet analyzed the data gathered and cannot at this time give an answer to the questions we posed.

The same subjects who participated in the training study described in Section VI.1, also participated in this procedure. Therefore, one factor represented in the design was whether subjects had received training in mapping as a study strategy or whether they were part of the control group. These two groups were each divided into two sub-groups. One half of the students received study questions prior to reading the text material that were appropriate in terms of reflecting the underlying structural pattern of the text to be read. The other half received inappropriate study questions, questions that could be answered by the text but that required taking the ideas presented and connecting them with a different set of high-level relationships. Thus, a compare/contrast text might have as an appropriate study question to compare two topics, and as an inappropriate question to describe one or both topics.

All participants read one text in its original version and one text rewritten to make explicit the connections between ideas and any ideas (concepts) left implicit in the original. The two texts were both from the Biology set, Text #104, Reproductive System of the Frog, and Text #115, the Linnaen System. In Section III.5, these two texts were identified as clear representatives of chronological organization and comparison organization, respectively. This topic was nested within text pattern and for any one subject, this was nested within clarity of presentation. Order of topic and of original versus rewritten versions of the texts was counterbalanced across the subjects. The original versions of the two texts can be found in Appendix D. Here we present the rewritten version of Text #104 as an example of what we mean by an "ideal" text.

> The sex organs of both male and female frogs are internal. Because of this, it is hard to tell the sexes apart, except during the breeding season, when the thumbs of the male are enlarged.
>
> Two oval testes are the major reproductive organs in the male reproductive system. The testes are a creamy-white or yellow color. They lie in the back, one on each side of the spine, in the anterior region of the kidneys. Sperm cells develop in the testes. Upon leaving the testes the sperms pass through tubes, called the vasa efferentia, and into the kidneys. As the sperms are discharged they pass into the ureters. Some frog species have an enlargement, called the seminal vesicle, at the base of each ureter. From the ureter the sperms pass into the cloaca.
>
> In the reproductive system of the female frog, the eggs develop in a pair of large lobed ovaries. The ovaries lie along the back above the kidneys. During the breeding season, the eggs enlarge and burst through the thin ovary walls. This frees the eggs into the body cavity. Once in the body cavity, the abdominal muscles

> work the eggs toward the anterior. In the anterior lies the opening to the oviduct. This opening is funnel-like and lined with cilia. The cilia sucks the eggs into the oviducts. The oviducts, which are long and coiled, lead into the cloaca. Near the openings to the cloaca, the walls of the oviduct secrete a jellylike substance. This substance surrounds each egg. From the cloaca the eggs pass into the saclike uterus. The uterus is located at the base of each oviduct. Here the eggs are stored until they are laid.

The students were instructed to keep the study questions presented along with text in mind as they read. If they were in the "appropriate" group, they saw the following study questions for Text #104:

1. Describe the male reproductive system from the time the sperm cells develop until they are discharged.
2. Describe the female reproductive system from the time the eggs are developed until they are laid.

If they were in the "inappropriate" group, they saw:

1. Compare the reproductive organs of the male to that of the female frog.
2. How are the reproductive systems in the male and female frog alike and how are they different?

They then read the text.

Measures included a metacognition rating question, the same study questions presented with the texts only now presented as essay questions, and finally, four short-answer questions related to specific information in the texts, identified as high and low level and explicit and implicit according to the list of relationship propositions. For example for Text #104, the four short-answer questions were:

(High/explicit) 1. Where specifically are the testes located?

(High/implicit) 2. What happens after the eggs in the female have enlarged?

(Low/explicit) 3. What reproductive organ is lined with ciliated cells?

(Low/implicit) 4. When the eggs leave the oviduct, where do they go?

Finally, the students responded to a rating question asking them how familiar they had been with the topic of the text before they had read about it as part of these experimental materials.

Once they had completed these measures on the first text of their packets, the students followed the same procedure for a second text.

Results will be analyzed to answer the following questions: (1) Do students learn more from texts that have been rewritten to make explicit their underlying message than from texts in their original, naturally occurring states? (2) Do students learn more when given study-guide questions that match the overall pattern of high-level ideas or do they benefit when given a different perspective or approach to the texts? (3) Will there be an effect shown in the performance of students trained in mapping, a strategy that should encourage them to focus on and make explicit the organization of ideas in an author's message? Answers to these questions should provide a basis for recommendations to textbook authors and to the authors of the ubiquitous study-guide questions, instructional objectives, and textbook exercises that accompany textbooks.

PART 2: THE EFFECTIVENESS OF ENGINEERED CONPARE/CONTRAST TEXTS

Ester Geva Robert Tierney

There were several reasons for examining the influence of various manipulations of compare/contrast texts. Apart from the fact that these texts emerged from our previous analyses (see section 3.5) as one of the clearest text types, there were a number of practical and research-based reasons to warrant our examination. In courses on writing, systematic variations of compare/contrast texts receive a great deal of emphasis, without a thoughtful consideration for the benefits or drawbacks of these different variations. In various fields of study, teachers present information on different topics in compare/contrast forms or ask question that require compare/contrast analyses. For example, a history teacher might present information on different events and expect students to make comparisons on their causes or effects. Also, the research literature suggests some interesting findings pertaining to compare/contrast texts. Geva and Hildyard (1979), for example, have argued that these texts represent a more difficult type of text structure. In addition, against a background of unclear effects for connectives in other research, Geva & Hildyard have suggested that connectives appear to have an interactive effect with this type of text.

Method

Materials. For purposes of examining the effects of systematic variations of compare-contrast texts, four passages were selected and systematically manipulated. These manipulations involved the omission of connectives as well as inclusion of structural variation. The structural characteristics of the texts were varied by intermixing or separating the information being presented. In the separated versions, the discussion of each point of view was kept distinct from one another. In the mixed version, the discussions of the two points of view were integrated, point by point. Examples of the passage which were developed for one topic are presented in Tables 7.1 to 7.4 .

Design. The study used a 4 X 4 split plot design with repeated measures. Subjects were tested within version type created by the crossed factors of separate/mixed and connectives/no connectives.

Table 7.1

Version Mixed/Connective

In recent months, Brigadier-General Paul Manson led a project team charged with selecting a new fighter aircraft for the Canadian Armed Forces. Two planes were under consideration: the twin-engined McDonnell Douglas Corp. F-18 and the single engined General Dynamics Corp. F-16.

When the two aircraft were first looked at on an airplane to airplane basis, early in the $2.3 billion program, there was little to distinguish between them. General Manson said in an interview that while at the beginning both seemed to be "great airplanes", it was when the fine-tuning began that noticeable and meaningful differences began to show up.

The F-16 has better speed and higher maneuverability than the larger F-18. Both airplanes are expected to be in the armed forces' inventory until at least the turn of the century and the large F-18 has a better capacity for the internal growth of its systems over the technological life of the plane. Also taken into account were the engines powering each plance. The P-404 engine that powers the F-18, built by the General Electric Company aviation group of Lynn, Massachusetts, is an exceptionally fine engine, as is the F-100 engine of the F-16, built by Pratt and Whitney of Hartford, Connecticut. However, the P-404 engine, of the F-18 is a simpler engine than the F-100 engine of the F-16; it does not represent the high technological advance of the F-100 engine (of the F-16), but it is easier to maintain and repair. Moreover, the P-404 twin engines of the F-18 have fewer parts than the F-100 single engine of the F-16.

There has been some concern with respect to the durability of the F-16. Would the aircraft be able to stand up to the demands that would be made on it? General Manson said that over the life of the aircraft there might be fewer peacetime losses with the twin-engined F-18. "If you have a flame out on patrol with the F-18, at least you can be sure of getting home on the other engine." On the other hand, the more advanced F-16 may be less susceptible to flame-outs.

Still, the initial investment will be higher for the F-18 than for the F-16 since the F-18 is an expensive plane. However, attrition on the F-18 is expected to be lower.

The recommendation of the committee has gone to the government and Generel Manson said that he expected an announcement would be made some time in the late spring.

Table 7.2

Version Mixed/No Connectives

In recent months, Brigadier-General Paul Manson led a project team charged with selecting a new fighter aircraft for the Canadian Armed Forces. Two planes were under consideration: the twin-engined McDonnell Douglas Corp. F-18 and the single engined General Dynamics Corp. F-16

When the two aircraft were first looked at on an airplane to airplane basis, early in the $2.3 billion program, there was little to distinguish between them. General Manson said in an interview that while at the beginning both seemed to be "great airplanes", it was when the fine-tuning began that noticeable and meaningful differences began to show up.

The F-16 has better speed and higher maneuverability than the larger F-18. Both airplanes are expected to be in the armed forces' inventory until at least the turn of the century. The large F-18 has a better capacity for the internal growth of its systems over the technological life of the plane. Taken into account were the engines powering each plane. The P-404 engine that powers the F-18, built by the General Electric Company aviation group of Lynn, Massachusetts, is an exceptionally fine engine, as is the F-100 engine of the F-16, built by Pratt and Whitney of Hartford, Connecticut. The P-404 engine of the F-18 is a simpler engine than the F-100 engine of the F-16. It is easier to maintain and repair. The P-404 twin engines of the F-18 have fewer parts than the F-100 single engine of the F-16.

There has been concern with respect to the durability of the F-16. Would the aircraft be able to stand up to the demands that would be made on it? General Manson said that over the life of the aircraft, there might be fewer peacetime losses with the twin-engined F-18. "If you have a flame out on patrol with the F-18, at least you can be sure of getting home on the other engine." The more advanced F-16 may be less susceptible to flame outs.

The initial investment will be higher for the F-18 than for the F-16. The F-18 is an expensive plane. Attrition on the F-18 is expected to be lower.

The recommendation of the committee has gone to the government. General Manson said that he expected an announcement would be made some time in the late spring.

Table 7.3

Version Seperate/Connectives

In recent months, Brigadier-General Paul Manson led a project team charged with selecting a new fighter aircraft for the Canadian Armed Forces. Two planes were under consideration: the twin-engined McDonnell Douglas Corp. F-18 and the single engined General Dynamic Corp. F-16.

When the two aircrafts were first looked at on an airplane to airplane basis, early in the $2.3 billion program, there was little to distinguish between them. General Manson said in an interview that while at the beginning they both seemed to be "great airplanes", it was when the fine tuning began that noticeable and meaningful differences began to show up.

The F-16 has a good speed and high maneuverability. Also taken into account was its exceptionally fine engine, the F-100, built by Pratt and Whitney of Hartford, Connecticut. This engine represents a high technological advance and, moreover, incorporates many more parts into its single engine. However, there has been some concern with respect to the durability of the F-16. Would the aircraft be able to stand up to the future demands that would be placed on it?

Both airplances are expected to be in the armed forces' inventory until at least the turn of the century, and the large F-18 has a better capacity for the internal growth of its system over the technological life of the plane. Furthermore, the P-404 engine that powers the F-18, built by the General Electric Company aviation group of Lynn, Massachusetts, is an exceptionally fine engine though it does not represent high technological advance. In addition, the P-404 is a simple engine, it has fewer parts, and is easy to maintain and repair. With respect to durability, General Manson said that over the life of the aircraft there would likely be few peacetime losses with the twin-engined F-18. "If you have a flame out on patrol with the F-18, at least you can be sure of getting home on the other engine." Yet the initial investment for the F-18 would be high, since the F-18 is an expensive plane. However its attrition rate is expected to be low.

The recommendation of the committee has gone to the government and General Manson said that he expected an announcement would be made some time in the late spring. The committee will have to base its decision on an combination of criteria such as initial investment, safety and performance.

Table 7.4

Version Separate/No Connectives

In recent months, Brigadier-General Paul Manson led a project team charged with selecting a new fighter aircraft for the Canadian Armed Forces. Two planes were under consideration: the twin-engined McDonnell Douglas Corp. F-18 and the single engined General Dynamics Corp. F-16.

When the two aircrafts were first looked at on an airplane to airplane basis, early in the $2.3 billion program, there was little to distinguish them. General Manson said in an interview that while at the beginning they both seemed to be "great airplanes", it was when the fine tuning began that noticeable and meaningful differences began to show up.

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The recommendation of the committee has gone to the government and General Manson said that he expected an announcement would be made some time in the late spring.

Subjects were crossed with topics (Anglo Americans versus Mexican Americans, Solid-fuel versus Liquid-fuel rockets, F-18 versus F-16 planes, Alternative causes for Juvenile Delinquency). In other words, subjects read the same version type of each of the four text topics. After reading each text, students were given a distractor exercise prior to being asked to generate a written recall.

Subjects. Participants were 62 high school students at a junior or senior level from a semi-rural area in Illinois. Most students' parents worked in local industrial plants or were farmers. The students' standardized test scores suggested they represented a normal range of reading abilities for students their age.

Analysis of recall. Subjects' recall protocols were scored by translating them into propositions, then comparing them to the template text base, and classifying them into types of propositions. Based upon a scoring system devised by Drum (1978), units of information in the subjects' recalls were scored as text reproduction (statements identical with or synonymous with propositions from the text), text entailments (statements which represented generalizations, summary statements or transformations of the text), text evocations (statements which were plausible inferences from the text), unrelated (statements which seemed implausible or irrelevant) and errors (statements which represented misinformation). For analysis purposes, the scores derived for text reproductions, text entailments and text evocations were totalled.

Recalls were also examined more globally. That is, each recall was examined for evidence of resolution--a judgement of the worth of one object or point of view over the other object or point of view being compared. For this purpose, recalls were classified according to judges' estimate of whether the students' recall best-represented one of the following: a description or listing of details without any evidence of resolution or comparison; a comparative analysis of details without any evidence of resolution; or an indication of resolution or preference for one point of view.

Finally, each recall was examined for any evidence of connectiveness. Whenever a reader included a form of conjunction in their recall, it was classified and tabulated. For our present analyses, a frequency count of connectives was made.

Results

Across the four sets of passages, a recurring finding emerged. Regardless of topic (Anglo-American versus Mexican-Americans, Solid-fuel versus Liquid-fuel rockets, causes of of juvenile delinquency, F-16 versus F-18 planes), one text condition emerged as more potent. Specifically, subjects in the mixed compare-contrast condition with connectives recalled more information, included less errors in their recalls, used more conjunctions and more of these subjects generated a resolution for the comparison. Consider the data for two of the four sets of the passages (see Table 7.5).

Subjects who read the text condition which was mixed with connectives included more information and made fewer errors. The difference between this version and all other text variations remained stable across all text topics.

Also, for the mixed conditon with connectives, subjects included more conjunctions in their recalls and were more prone to resolve the comparisons (see Table 7.6). Certainly, it can be argued that recalls may not lend themselves to an analysis of conjunctions and that the use of conjunctions may or may not be related to a more coherent memory for text. Nonetheless, these data do at least provide some collaboration for qualitative differences due to text variations.

With respect to resolution, a similar argument can be made. Again, recalls may not be the most appropriate method by which readers' resolution of a comparison might be measured. Yet these data do seem to corroborate with our other findings. In this regard, if the resolution of comparisons is desired, then the recall data support the mixed condition with connectives over other ways of presenting comparisons.

Conclusions

Taken together these data suggest that the recalls of students for compare/contrast texts are very susceptible to systematic variations of these texts. In general, they support the thesis that text manipulations can and do have an impact upon students' memory for text with respect to compare/contrast texts. They suggest that students are apt to recall different amounts of information and produce qualitatively different recalls if they are presented information in alternative overall structures with and without explicit connectives. From a

Table 7.5

		Anglo-American versus Mexican-American		Solid-fuel versus Liquid-fuel	
		Text Units Recalled	Errors in Recall	Text Units Recalled	Errors in Recall
		$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
Separate	Connectives	6.5	1.5	6.6	1.1
	No Connectives	6.6	1.2	9.3	.5
Mixed	Connectives	7.6	1.0	10.4	.36
	No Connectives	5.6	1.6	8.4	.88

Table 7.6

Mean Number of Conjunctions and Resolutions
in Written Recalls

		Conjunctions	Resolutions
Separate	Connectives	3.96	.2
	No Connectives	4.51	.1
Mixed	Connectives	5.41	.25
	No Connectives	4.54	.2

practical perspective, these data suggest that if more recall, with fewer errors and more likelihood of resolution is the goal for using compare/contrast texts, then the most facilitative way of presenting the information is to use a mixed condition with connectives. This finding should be considered by educators and writers of educational materials.

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VIII
SUMMARY

We began with a general goal of describing the nature of the language found in content-area textbooks and of how students learn from their texts. We approached this general goal through a series of theoretical, methodological and empirical investigations guided by five specific project goals:

1. To describe how high school students and teachers perceive and use their textbooks.
2. To define the characteristics of expository text language in diverse fields of study.
3. To examine the interaction of text characteristics with reader characteristics as students learn from text.
4. To determine the influence of instructional procedures upon students' ability to learn from text.
5. To determine the influence of text manipulations upon the quality of what students learn from text.

In this last section of our report, we summarize the conclusions we believe are suggested by our investigations and describe the products we have developed in the course of working toward a fulfillment of our project goals.

Methodological Tools

As we began our investigations, we immediately felt the need to create two special measurement and analysis tools. One was related to a measure of students' views of the use of their textbooks and difficulties they incur when studying. Since we could not locate a relevant survey, we developed our own questionnaire (see Section II and Appendices A and B), comprised of four major sections and individual items.

As we attempted to describe selected samples of text taken from naturally-occurring textbooks, we were not completely satisfied with the focus of available systems of analysis. Those that were sufficiently detailed best lent themselves to the description of text demands as a comprehender builds a construction of a text, word-by-word or proposition-by-proposition.

Since we had undertaken to describe expository text, we were interested in what we saw as the major function or intent of such text, to get readers to acquire new concepts and new ways of organizing concepts. We needed a text analysis system that dealt less with the surface representation of text and more with the underlying concepts and structures. Further, we wanted a system that would represent what the author intended students to learn from the text. To fulfill these requirements and needs, we developed relational mapping (see Section III.1), which we see as a text analysis system specifically suited to describing what students should (need) learn when they read expository text.

These two products, the questionnaire and the text analysis method, were unplanned and only developed in response to particular research needs we encountered as we began the project. Yet, we feel they may have more enduring value than our empirical findings in view of the typically short half-life of research results in the social sciences. We have already received many requests for the textbook survey and for descriptions of relational mapping. We, as researchers and educators, are often more interested in and have a greater need for approaches and tools to help us investigate phenomena of our own choosing than to acquire one more report of the results of someone's investigation.

Conclusions from Empirical Investigations

Throughout the course of the project, we and our students and associates were involved in twelve experimental procedures. In this next section, we briefly describe the major conclusions we feel are suggested by the data gathered.

Experiment 1, results of the survey of students' use of their textbooks. Students reported that they generally read the assigned pages in their textbook all the way through only once and that they seldom consulted other text sources on the topic. In studying, their preferred strategy was to memorize portions of the text. Although some differences were observed between men and women students and between Biology and History classes, generally the same restricted range of uses of the textbook was found.

The students consistently reported that their textbooks were difficult because important ideas were not identified for them, they seemed to be expected to know more about the topic than was actually the case, not enough examples and clarifications of key ideas were provided, and the textbooks were just plain boring. In terms of their perception of the effectiveness of their strategies as they studied their textbooks, students mentioned that their major difficulties were with concentrating while reading, remembering what was read, knowing how well the information just read will be remembered later on and being able to identify how ideas were related.

Experiment 2, the nature of textbook language. We began by asking high school teachers to identify critical sections of a chapter that was still to come in the curriculum. Those sections, identified as instructionally important, were reduced to 30 samples of approximately 300 words, 16 from Biology and 14 from American History textbooks. The 30 passages were submitted to relational mapping analysis. Results generally indicated that the authors of our samples were frequently implicit about how ideas they were expressing were logically connected to each other. High level ideas, or ideas that are close to the main topic of a text, were just as likely to remain implicitly tied to other ideas in a text than low level ideas. In addition, we found that our authors relied on properties and examples as the major way of developing topics. Nevertheless, 24% of their ideas pertained to the distinctive relationships (definition, comparison, temporal, and causal) that relational mapping depicts so well.

Experiment 3, the learnability of textbook language. The sample texts identified and analyzed in Experiment 2 above were presented to students to learn. The free recalls produced by the students were analyzed by comparing them to the appropriate lists of relationships propositions. Scores for each text unit were computed by taking the proportion of students who had produced that unit either explicitly or implicitly in their recalls.

Results indicated that in general texts were poorly recalled, the grand mean of both History and Biology texts being below 21%.

Text units that were only implied by authors were less likely to be learned than text units that were explicit. Example propositions, or ideas that state that a concept is tied to another by virtue of being its example, were surprisingly vulnerable in students' recall.

On a more positive note, students were sensitive to the centrality of any idea in that they favored ideas high in text structure, closely tied to the main topic and sub-topics of a text. This finding is in agreement with results stemming from a number of other studies and lends validity to the concept of embeddedness as defined by our relational mapping analysis.

Our major recommendation to textbook authors based on our findings is that they consider making the connections between ideas more explicit, particularly when relating concepts that are crucial to the development of a topic. To teachers, we suggest that they examine their textbooks, and perhaps their lectures, for instances of important information not explicitly tied by a relationship marker to other information in the text. We are of course aware that there are many potential uses of a textbook in a classroom and as many ways of selecting information to be emphasized and tested. In classrooms where the teacher generally asks very specific, low level (detail) questions that are explicitly slated in the text, our recommendations will not suit. However, in classrooms where tests measure how well students are getting the broad "picture" of a topic, and where they are expected to learn from their textbooks, teachers should be aware, we believe, of the special difficulties incurred by the texts they assign.

Experiment 4, topic continuity and cohesion as contributors to text coherence. High school students were employed in two different procedures to test aspects of cohesion and topic continuity in our text samples. For cohesion, they were asked to rate the ease of resolution and the importance of each cohesive tie in a text. Results indicated that in each of the eight passages submitted to this analysis, there were several points that were considered both very important and very difficult to resolve. With respect to topic continuity, the students were asked to rate the predictability of the second of successive pairs of ideas in a text. Results here indicated that (a) topic discontinuity manifests itself frequently in informative text, (b) as a group, the Biology texts included more topic shifts and more points in the texts that students rated as unpredictable, (c) discontinuity across passages was detected most frequently at transitions where the connection between topics was either weak or entirely lacking, and (d) among the major factors that students suggested as contributing to discontinuity was the authors' failure to set up adequately the presentation of new ideas.

Experiment 5, patterns of text. The maps of the 30 sample texts, serving as visual displays of the structure of ideas and their interrelationships, were given to expert and novice text analysts to categorize. The instructions simply asked the subjects to put together those maps that seem to display the same kind of overall structure. From the categories produced, texts were perceived to go with certain other texts to different degrees. Clusters of texts were found that we labeled, "description", "process" or "chronology", "comparison", and a fourth category that received the ungainly label of "causal description of concepts."

The same subjects were then engaged in a second procedure that involved rating the degree of match between each map (text) and each of the four category labels we had created in response to the first procedure. Results indicated that some texts were strongly identified as being of one type (true of some descriptive texts) and some were not strongly identified with any of the categories. Comparison and process texts were interesting in that both showed a strong identification with each of the appropriate categories as well as a fairly strong identification with description.

We concluded from our results that the concept of pure text types was not in line with what exists in naturally-occurring expository texts. True, some of our sample texts were seen as representing clear and simple patterns of ideas. Most, however, seemed to be perceived as hybrids or unclear combinations of many structural relationships. Thus the concept of "text types" in informative text might best be viewed as "text-typedness," replacing a categorical concept with a continuum.

Experiment 6, validating the concept of embeddedness. One of the products of relational mapping is a derived measure of the height of an idea in the structure of a text or of how close to the main topic an idea is. It is a well established empirical finding that main points, important ideas, or ideas high in text structure as identified by various other means are likely to be remembered. In this experiment, we hoped to establish the psychological validity of our embeddedness measure and to identify it as similar to these other means of predicting which ideas in discourse are most memorable.

College undergraduates were asked to read one of our sample texts and then to rate the importance of a set of sentences derived from the text. The sentences have been developed to reflect high and low level ideas, stated either explicitly or implicitly in the text.

Results confirmed our expectations. Sentences identified as high level as a result of relational mapping were rated as significantly more important than low level sentences, thus providing psychological validity to our text analysis system.

Experiment 7, individual differences in learning from texts in different fields of study. The students of the teachers who had identified critical portions of their textbook as part of Experiment 2 above were presented with two samples from their textbooks, asked to read and learn them, to produce a free recall, answer short-answer questions, select three main ideas from a list of eight taken from the text, and estimate how well they would and had understood the samples as well as how well they had performed on the learning measures. In this part of the report, we presented data relative to gender and field of study differences in the recall, main idea identification measure and the first two metacognition measures. Results generally indicated that there were no significant differences between men and women students in terms of learning measures. There were some differences in the metacognition ratings but these went counter to what we would have predicted: women students were more confident when learning Biology and men more confident when learning History.

Experiment 8, learning from instructional discourse in a college geology course. As a dissertation project, one of our students, Sarah Ulerick, extended the use of relational mapping to describe the lecture, lab manual and textbook chapter on one topic being presented as part of a true instructional setting, an introductory geology course. She found that she could use mapping as the basis for identifying occasions where two or more of the discourses did and did not agree in terms of the structural ties surrounding a particular concept. Where there was apparent disagreement, integration on the part of the students was called for.

The major findings of the study were that students found it relatively easy to answer questions dealing with literal explicit information. They had much more difficulty answering questions that asked them to integrate concepts across discourse boundaries.

Experiment 9, mapping as an aid in helping students learn from their textbooks. In this experiment, we attempted to induce students to learn more from their textbooks by training them in the use of mapping as a form of summarizing text material. College students were assigned to a trained and a control group and were measured before and after the training period. Results were generally disappointing. The control group did as well as and in some cases better than the trained group and all students did not show any improvement on the posttest. Perhaps the strategy had not been learned well enough. The training lasted a total of three class sessions, which may not have been long enough to produce any effect. We do know that mapping requires a relatively intense and effortful commitment on the part of the learner. It may be that as a study strategy, it is doomed to failure unless students see the value and the pay-off for their extra effort.

Experiment 10, investigating a topic/subtopic strategy for improving learning from text. Again, our conclusions from an attempt at training students to deal more effectively with their textbooks were equivocal at best. Here, one of our students, Karen Margolis, as part of her dissertation, trained high school students to identify topics and subtopics in text and to note the relationship that held between them. Although there seemed to be some improvement shown in students' ability as they were being trained, the effect was not reflected in the criterion measure.

Experiment 11, the learnability of ideal texts derived from maps. One conclusion to be drawn from the results obtained as a result of Experiments 2 through 5 described in Section III was that textbook authors were not always as helpful as they might be in presenting their ideas to students. In this experiment, we set out to rewrite some of the texts from our sample, using the maps made of the original texts as a guide. Since a map represents explicitly all the ideas and all their interrelationships needed to make a coherent discussion of a topic, it can serve as a guide to producing an improved version of what the author of a text must have intended to say. In addition, we were interested in the effect of providing students with study-guide questions that either did or did not match the underlying overall organization of ideas.

Although we have gathered the necessary data by asking freshmen-level college students to learn original and rewritten versions of two of our sample texts, we have not yet scored and analyzed their responses. Major questions we will ask of the data are: (1) Do students learn more from texts that have been rewritten to make explicit and orderly their underlying message than from texts in their original, naturally occurring states? (2) Do students learn more when given study-guide questions that match the overall pattern of high-level ideas or do they benefit when given a different perspective on the text?

Experiment 12, the effects of engineered compare/contrast texts. Four versions of different topics were compared, all representing types of comparison texts. In one version, the two objects or points of view being compared were kept separate with the discussion of one appearing first before the discussion of the other. In another version, the discussions of the two concepts were integrated point by point. Each of these two structural variations were then written either with explicit connectives or with no explicit connectives. High school students read one version of each of four topics and produced free recalls following each.

Results were quite clear. Students reading the intermixed versions with explicit connectives recalled more ideas; included fewer errors, used more connectives, and more of these students generated some sort of resolution of the contrasting concepts being presented. In light of these findings, we feel encouraged to conclude that, at least within a comparison structure, the engineering of text will have a significant effect on what students do with the texts.

Theoretical Papers

In addition to the experiments and methodological tools we developed, we produced theoretical critiques of methods of text analysis. These appear in Section IV, Parts 2 and 3. The major point we make in these critiques is that existing systems of text analysis run the danger of being used to talk about texts as having invariant structures. We argue that text analysis systems are best viewed as research tools to help investigators describe texts and as such, reflect the text analyst's own understanding of the text rather than some inherent feature of text.

Conclusion

We believe we have come a long way since we began in describing the nature of textbook language and of how students learn from their textbooks. We know a great deal particularly about those 30 300-word selections taken from secondary level Biology and History textbooks that became the basis of materials in nine of the twelve exeriments we conducted. We believe that many of our conclusions are of potential interest to other researchers interested in how people learn, how they learn from text, and how authors write. The producers of textbooks, authors and editors alike, may want to consider our findings in future editions. Finally educators may be encouraged to take special tactics in helping their students understand their textbook authors' message.

LEARNING FROM EXPOSITORY TEXT: THE INTERACTION OF TEXT STRUCTURE WITH READER CHARACTERISTICS (NIE-G-79-0167)

(continuation)

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Appendix A

Survey Administered to Texas Students

(refer to Section II)

Print your middle name and last
letter of your last name: ______________________________

Sex: ____________

Grade: ____________

Age: ____________

Class you are in right now
(give name of teacher and time): ______________________

STUDY SURVEY

DIRECTIONS: Rate the following items by placing a check below the appropriate number. The numbers correspond to the following labels:

1	2	3	4	5
never	almost never	sometimes	almost always	always

I. When you read a chapter in your textbook, to what extent do you use the following methods of study:

	never 1	2	3	4	always 5
a) Construct an outline(s) for information in the chapter:					
b) Take notes while you read the chapter?					
c) Take notes after you read the chapter?					
d) Underline selected ideas in the chapter?					
e) Answer questions and/or complete activities provided in the chapter?					
f) Attempt to memorize portions of the chapter?					
g) Read the chapter through only once (without or before engaging any other activities, e.g. notetaking, outlining, underlining)?					
h) Reread the chapter several times?					
i) Ask yourself questions about the chapter prior to, during and/or after reading?					
j) Ask the teacher to explain the entire chapter or portions of it?					
k) Ask other students to explain the entire chapter or poptions of it?					
l) Discuss the entire chapter or portions of it with others?					
m) Read the entire chapter or portions of it aloud?					
n) Read a chapter summary before beginning your reading of the chapter?					
o) Review the headings given for chapter subsections before beginning your reading of the chapter?					
p) Read other sources on the topic(s) covered in the chapter?					

I. (cont'd) When you read a chapter in your textbook, to what extent do you use the following methods of study:

	never 1	2	3	4	always 5
p) Read other sources on the topic(s) covered in the chapter?					
q) Summarize in your own words the chapter or portions of it?					
r) Think about what you do and do not know about the topic before reading the chapter?					

s) Please specify any additional methods of study you use :

II. How often do you find a chapter in your textbook difficult to understand because:

	never 1	2	3	4	always 5
a) The text uses vocabulary which is difficult to understand?					
b) The text does not clearly point out the main ideas?					
c) The text expects you to know more about what you are reading than you do?					
d) The text does not provide enough examples or clarification of key ideas?					
e) The text is poorly organized - that is, the text is written in a way which is difficult to follow?					
f) The text does not provide sufficient introductory or background information before presenting new ideas?					
g) The text does not attempt to relate ideas to what you already know about the topic?					
h) The text is out-of-date - that is, the text does not discuss current issues?					
i) The text presents irrelevent information which is not related to the purpose for which the text is intended?					
j) The text does not point out important relationships between key ideas?					
k) The text does not include a good summary of the chapter?					
l) The text does not cover as much of the topic as the teacher expects you to know?					
m) The text goes into more detail than is appropriate for your purposes?					

If you have any other information which may be relevant to any strengths or weaknesses of the textbook, pleasesppecify:

APART FROM THOSE AREAS ABOUT WHICH YOU HAVE BEEN QUESTIONED:

Describe those aspects of your textbook which make it difficult for you to read and understand a chapter:

Describe those aspects of your textbook which help, assist or make it easier for you to read and understand a chapter:

DIRECTIONS: Rate the following items by placing a check below the appropriate number. The numbers correspond to the following labels:

a 1	2	3	4	5
a lot of difficulty	some difficulty	occasional difficulty	rarely any difficulty	never any difficulty

III. When you read a chapter in your textbook, to what extent do you have difficulty with each of the following:

	a lot 1	2	3	4	never 5
a) Identifying important ideas in the chapter?					
b] Identifying relationships between ideas in the chapter?					
c] Understanding difficult vocabulary?					
d] Interpreting diagrams, graphs, etc.?					
e] Constructing an outline for the information in the chapter?					
f) Taking notes while you read the chapter?					
g) Taking notes after you have read the chapter?					
h) Summarizing the chapter in your own words?					
i) Generating questions to guide your reading of the chapter?					
j) Answering questions or completing activities the text has provided?					
k) Answering questions or completing activities the teacher has provided?					
l) Preparing for an exam or quiz?					
m) Changing your reading rate (skimming, previewing, reading slowly) with your purpose for reading and type of material you are reading?					
n) Knowing how well you have either understood or misunderstood what you have read?					
o] Knowing how well you will be able to remember what you have read?					
p] Remembering what you have read a day later?					
q) Remembering what you have read a week later?					
r) Concentrating as you read the chapter?					

If you have any other information which may be relevant to any strengths and weaknesses you may have dealing with chapters in the textbook, please specify:

APART FROM THOSE AREAS ABOUT WHICH YOU HAVE BEEN QUESTIONED:

Describe the types of difficulties which you have when you read a chapter in your text:

Describe any difficulties that you have when you prepare for an exam on a particular chapter:

Appendix B

Survey Administered to Illinois Students

(refer to Section II)

Print your middle name and last

letter of your last name:__________________________________

Sex:__________________

Grade:___________________

Date of birth:_______________________________
Month/day/year

Class you are in right now

(give name of teacher and time):___________________________

School:_______________________________

PART I

DIRECTIONS: Please read and circle a response for each item below. Choose only one response for each item.

When you study a chapter in your textbook, how often do you use the following methods?

1. outline the ideas in the chapter

never   sometimes   almost always   always

2. take notes from what you have read in the chapter

never   sometimes   almost always   always

3. underline important ideas in the chapter

never   sometimes   almost always   always

4. summarize in your own words the chapter or parts of it

never   sometimes   almost always   always

5. answer the questions given in the text or complete the activities you find included

never   sometimes   almost always   always

6. try to memorize important parts of the chapter

never   sometimes   almost always   always

7. pause to think about what you do and do not know about the topic of the chapter before you begin to read

never sometimes almost always always

8. ask yourself questions about ideas in the chapter

never sometimes almost always always

9. review all of the headings given in the chapter before you begin to read the chapter

never sometimes almost always always

10. read a chapter summary before you begin to read the chapter

never sometimes almost always always

11. read the chapter through only once (without doing or before you do any notetaking, outlining, underlining etc.)

never sometimes almost always always

12. reread the chapter several times

never sometimes almost always always

13. read the entire chapter or parts of it aloud to yourself

never sometimes almost always always

14. ask the teacher to explain the entire chapter or parts of it

never sometimes almost always always

15. ask other students to help explain the entire chapter or parts of it

never sometimes almost always always

16. discuss the entire chapter or parts of it with others

never sometimes almost always always

17. read other books on the topic(s) discussed in the chapter

never sometimes almost always always

18. Describe step by step how you study a textbook chapter. Be sure to include any additional methods of study you use which were not mentioned above.

____

____

____

____

____

PART II

DIRECTIONS: Please read and circle a response for each item below. Choose only one response for each item.

How often do you find that the following are problems which make your textbook difficult to understand?

1. the text uses words which are difficult to understand

never a problem	sometimes a problem	almost always a problem	always a problem

2. the text does not tell you which ideas in the chapter are important; that is, which ideas you should remember

never a problem	sometimes a problem	almost always a problem	always a problem

3. the text does not tell you how one important idea is related to another important idea.

never a problem	sometimes a problem	almost always a problem	always a problem

4. the text does not explain how new ideas are related to things you already know

never a problem	sometimes a problem	almost always a problem	always a problem

5. the text organizes ideas in a way which is difficult to follow

never a problem	sometimes a problem	almost always a problem	always a problem

6. the text does not include enough background information before it discusses new ideas

never a problem	sometimes a problem	almost always a problem	always a problem

7. the text does not include enough examples to help you understand new ideas.

never a problem	sometimes a problem	almost always a problem	always a problem

8. the text does not include a good summary of the important ideas in the chapter

never a problem	sometimes a problem	almost always a problem	always a problem

9. the text expects you to know more about what you are reading than you usually do

never a problem	sometimes a problem	almost always a problem	always a problem

10. the text does not discuss as many of the ideas as the teacher expects you to know

never a problem	sometimes a problem	almost always a problem	always a problem

11. the text spends too much time discussing ideas the teacher does not expect you to know

never a problem	sometimes a problem	almost always a problem	always a problem

12. the text is out-of-date--that is, the text does not discuss current issues

never a problem	sometimes a problem	almost always a problem	always a problem

13. Please describe any other strengths and weaknesses of your textbook.

Strengths

Weaknesses

PART III

DIRECTIONS: Please read and circle a response for each item below. Choose only one response for each item.

When you study a chapter in your textbook, how difficult is it for you to:

1. identify important ideas in the chapter

very difficult	sometimes difficult	hardly ever difficult	never difficult

2. identify how important ideas are related

very difficult	sometimes difficult	hardly ever difficult	never difficult

3. understand difficult words

very difficult	sometimes difficult	hardly ever difficult	never difficult

4. understand diagrams, graphs, etc.

very difficult	sometimes difficult	hardly ever difficult	never difficult

5. outline the information in the chapter

very difficult	sometimes difficult	hardly ever difficult	never difficult

6. take notes from what you read in the chapter

very difficult	sometimes difficult	hardly ever difficult	never difficult

7. summarize the chapter in your own words

very difficult	sometimes difficult	hardly ever difficult	never difficult

8. think of questions to ask yourself about what you are reading

very difficult	sometimes difficult	hardly ever difficult	never difficult

9. recall something you already know that will relate to what you are reading

very difficult	sometimes difficult	hardly ever difficult	never difficult

10. answer the questions or complete the activities included in the chapter

very difficult	sometimes difficult	hardly ever difficult	never difficult

11. answer the questions or complete the activities the teacher has provided

very difficult	sometimes difficult	hardly ever difficult	never difficult

12. change your reading rate (skimming, previewing, reading slowly) with your purpose for reading and type of material you are reading

very difficult	sometimes difficult	hardly ever difficult	never difficult

13. prepare for an exam or quiz

very difficult	sometimes difficult	hardly ever difficult	never difficult

14. know how well you have either understood or misunderstood what you have read

very difficult	sometimes difficult	hardly ever difficult	never difficult

15. know how well you will be able to remember what you have read

very difficult	sometimes difficult	hardly ever difficult	never difficult

16. remember what you have read a day later

very difficult	sometimes difficult	hardly ever difficult	never difficult

17. remember what you have read a week later

very difficult	sometimes difficult	hardly ever difficult	never difficult

18. concentrate as you read the chapter

very difficult	sometimes difficult	hardly ever difficult	never difficult

19. Please describe any other difficulties you have when you study a chapter in your text.

____

____

____

____

____

PART IV

DIRECTIONS: Please read and circle a response for each item below. Choose only one response for each item.

Listed below are things your teacher may do sometimes with your textbook. Indicate whether you would agree that it is important that your teacher do the following.

1. spend more time explaining the chapter before I read it

strongly agree	agree	disagree	strongly disagree

2. go over the chapter in class before a test

strongly agree	agree	disagree	strongly disagree

3. tell me which ideas in the chapter I should remember

strongly agree	agree	disagree	strongly disagree

4. explain how new ideas are related to things I already know

strongly agree	agree	disagree	strongly disagree

5. explain the difficult words in the chapter

strongly agree	agree	disagree	strongly disagree

6. discuss information which the chapter has not covered

strongly agree	agree	disagree	strongly disagree

7. provide me an overview or outline of the chapter

strongly agree | agree | disagree | strongly disagree

8. provide questions to guide my reading of the chapter

strongly agree | agree | disagree | strongly disagree

9. provide additional material to read (handouts, books, etc.)

strongly agree | agree | disagree | strongly disagree

10. give me time in class to read the text

strongly agree | agree | disagree | strongly disagree

11. let me read the text for myself instead of making reading assignments

strongly agree | agree | disagree | strongly disagree

12. give students time in class to get together and discuss the ideas in the text

strongly agree | agree | disagree | strongly disagree

13. assign additional activities to help me understand the ideas in the chapter

strongly agree | agree | disagree | strongly disagree

14. teach me how to find out which ideas in the chapter are important

strongly agree   agree   disagree   strongly disagree

15. teach me how to find out whether one important idea is related to another

strongly agree   agree   disagree   strongly disagree

16. spend time teaching reading skills (skimming, previewing)

strongly agree   agree   disagree   strongly disagree

17. spend time teaching study skills (notetaking, outlining, summarizing)

strongly agree   agree   disagree   strongly disagree

18. use a textbook which is easier to read

strongly agree   agree   disagree   strongly disagree

19. use a textbook which is more interesting to read

strongly agree   agree   disagree   strongly disagree

20. use a textbook which is more up-to-date

strongly agree   agree   disagree   strongly disagree

21. not use the textbook at all

strongly agree   agree   disagree   strongly disagree

22. Please describe anything else you would suggest the teacher might do to help you study a chapter in your text.

APPENDIX C

TABLES RELEVANT TO SECONDARY STUDENTS' USE OF SOCIAL STUDIES AND BIOLOGY TEXTS

(refer to Section II)

Table 3A:

Texas Students' Responses to Survey: Part I

Frequency of Response

(Almost Never, Sometimes, Almost Always, Always)

1.	complete textbook questions/activities	(79%)
2.	memorize portions of chapter	(67%)
3.	read chapter through once	(66%)
4.	review subheadings	(57%)
5.	evaluate extent of poor knowledge	(50%)
6.	discuss chapter with others	(48%)
7.	reread chapter several times	(48%)
8.	self-questioning	(47%)
9.	summarize the chapter	(45%)
10.	ask teacher to explain	(44%)
11.	underlining	(43%)
12.	read chapter summary	(39%)
13.	notetaking after reading chapter	(38%)
14.	notetaking while reading	(34%)
15.	ask other students to explain	(34%)
16.	read other sources	(30%)
17.	read the chapter aloud	(24%)
18.	construct an outline	(16%)

TABLE 3B

Texas Students' Responses to Survey: Part I

Question	N	Mean	Standard Deviation	1 Never	2 Almost Never	3 Sometimes	4 Almost Always	5 Always
1. Construct an outline(s) for information in the chapter.	275	1.5418	.8245	.64 (176)	.20 (56)	.14 (38)	.01 (3)	.01 (2)
2. Take notes while you read the chapter.	275	2.0727	1.1279	.41 (113)	.25 (69)	.24 (65)	.06 (16)	.04 (12)
3. Take notes after you read the chapter.	275	2.1782	1.1498	.37 (102)	.25 (69)	.25 (69)	.08 (23)	.05 (12)
4. Underline selected ieas in the chapter.	275	2.2327	1.2099	.39 (108)	.18 (49)	.28 (78)	.10 (26)	.05 (14)
5. Answer questions and/or complete activities provided in the chapter.	274	3.1825	1.0143	.07 (18)	.14 (39)	.43 (119)	.26 (71)	.10 (27)
6. Attempt to memorize portions of the chapter.	276	2.9275	1.1948	.15 (42)	.18 (51)	.36 (98)	.20 (55)	.11 (30)
7. Read the chapter through only once (without or before engaging any other activities, e.g., notetaking, outlining, underlining).	275	3.0327	1.1941	.11 (31)	.23 (62)	.31 (85)	.22 (61)	.13 (36)
8. Reread the chapter several times.	273	2.4396	1.0834	.23 (64)	.29 (79)	.31 (84)	.14 (38)	.03 (8)
9. Ask yourself questions about the chapter prior to, during and/or after reading.	276	2.4601	1.0897	.22 (60)	.31 (87)	.30 (82)	.13 (36)	.04 (11)

TABLE 3B (continued)

Question	N	Mean	Standard Deviation	1	2	3	4	5
				Never	Almost Never	Sometimes	Almost Always	Always
10. Ask the teacher to explain the entire chapter or portions of it.	274	2.3577	1.0672	.26 (70)	.30 (83)	.29 (81)	.12 (33)	.03 (7)
11. Ask other students to explain entire chapter or portions of it.	276	2.0290	1.0122	.40 (110)	.26 (72)	.26 (73)	.07 (18)	.01 (3)
12. Discuss the entire chapter or portions of it with others.	275	2.4218	1.1058	.25 (69)	.27 (74)	.33 (91)	.11 (29)	.04 (12)
13. Read the entire chapter or portions of it aloud.	273	1.8242	1.0668	.54 (146)	.22 (61)	.14 (39)	.08 (22)	.02 (5)
14. Read a chapter summary before beginning your reading of the chapter.	274	2.2591	1.1838	.34 (94)	.27 (73)	.23 (62)	.11 (32)	.05 (13)
15. Review the headings given for chapter subsections before beginning your reading of the chapter.	275	2.7636	1.2638	.19 (53)	.24 (65)	.31 (86)	.13 (36)	.13 (35)
16. Read other sources on the topic(s) covered in the chapter.	276	2.0906	.9737	.31 (86)	.39 (108)	.21 (57)	.08 (21)	.01 (4)
17. Summarize in your own words the chapter or portions of it.	273	2.4103	1.0915	.24 (65)	.31 (85)	.29 (79)	.12 (34)	.04 (10)
18. Think about what you do and do not know about the topic before reading the chapter.	272	2.5441	1.1126	.19 (53)	.31 (83)	.32 (87)	.12 (33)	.06 (16)

Table 4A

Illinois Students' Responses to Survey: Part I

Frequency of Response

(Sometimes, Almost Always, Always)

1.	memorize portions of chapters	(91%)
2.	complete textbook questions/activities	(82%)
3.	discuss chapter with others	(82%)
4.	notetaking	(77%)
5.	ask teacher to explain	(76%)
6.	read the chapter through once	(74%)
7.	self-questioning	(72%)
8.	ask other students to explain	(65%)
9.	summarize the chapter	(64%)
10.	evaluate extent of poor knowledge	(62%)
11.	reread chapter several times	(60%)
12.	underlining	(56%)
13.	construct an outline	(56%)
14.	review headings	(56%)
15.	read chapter summary	(55%)
16.	read chapter aloud	(47%)
17.	read other sources	(25.5%)

TABLE 4 B

Illinois Students' Responses to Survey

Part I

Question	Mean	Standard Deviation	1 never a problem	2 sometimes a problem	3 almost always a problem	4 always a problem
1. Outline the ideas in the chapter	1.7061	.7450	.44 (153)	.44 (152)	.10 (33)	.02 (9)
2. Take notes from what you have read in the chapter	2.0893	.8402	.23 (81)	.52 (181)	.17 (58)	.08 (27)
3. Underline important ideas in the chapter	1.8040	.8579	.44 (153)	.36 (124)	.16 (55)	.04 (15)
4. Summarize in your own words the chapter or parts of it	1.8646	.8270	.36 (126)	.46 (161)	.12 (41)	.06 (19)
5. Answer the questions given in the text or complete the activities you find included	2.1758	.7721	.18 (62)	.51 (178)	.26 (91)	.05 (16)
6. Try to memorize important parts of the chapter	2.7061	.9374	.09 (32)	.35 (122)	.32 (109)	.24 (84)
7. Pause to think about what you do and do not know about the topic of the chapter before you begin to read	1.8588	.8330	.38 (131)	.43 (151)	.14 (48)	.05 (17)
8. Ask yourself questions about ideas in the chapter	2.0144	.8275	.28 (97)	.48 (167)	.18 (64)	.06 (19)
9. Review all the headings given in the chapter before you begin to read the chapter	1.9049	.9882	.44 (151)	.33 (114)	.13 (46)	.10 (36)

TABLE 4B (continued)

Question	Mean	Standard Deviation	1 never a problem	2 sometimes a problem	3 almost always a problem	4 always a problem
10. Read the chapter summary before you begin to read the chapter[c]	1.9335	1.0515	.45 (156)	.30 (104)	.11 (39)	.14 (47)
11. Read the chapter through only once	2.2939	1.0313	.26 (88)	.37 (129)	.20 (70)	.17 (60)
12. Reread the chapter several times	1.8329	.8471	.40 (139)	.42 (146)	.12 (43)	.06 (19)
13. Read the entire chapter or parts of it aloud to yourself	1.6398	.7901	.53 (183)	.33 (116)	.11 (38)	.03 (10)
14. Ask the teacher to explain the entire chapter or parts of it[c]	1.9653	.7093	.24 (82)	.59 (205)	.14 (48)	.03 (11)
15. Ask other students to help explain the entire chapter or parts of it	1.7752	.6725	.35 (120)	.55 (191)	.09 (30)	.01 (6)
16. Discuss the entire chapter or parts of it with others	2.0922	.7547	.18 (64)	.60 (207)	.16 (56)	.06 (20)
17. Read other books on the topic(s) discussed in the chapter	1.2738	.4898	.743 (258)	.242 (84)	.012 (4)	.003 (1)

Note. The question was "When you study a chapter in your textbook how often do you use the following methods?"

[a] N = 347

[b] actual number is in parenthesis

[c] N = 346

Table 5

Texas Frequency of Response by Subjects

Biology			History		
1.	complete textbook questions/activities	(75%)	1.	complete textbook questions/activities	(90%)
2.	read the chapter through once	(67%)	2.	memorize portions of chapter	(75%)
3.	memorize portions of chapter	(63%)	3.	read the chapter through once	(64%)
4.	review headings	(55%)	4.	review headings	(63%)
5.	evaluate extent of prior knowledge	(48%)	5.	discuss chapter with others	(60%)
6.	self-questioning	(46%)	6.	reread chapter several times	(59%)
7.	reread chapter several times	(44%)	7.	summarize the chapter	(55%)
8.	discuss chapter with others	(44%)	8.	evaluate extent of poor knowledge	(54%)
9.	underlining	(42%)	9.	ask teacher to explain	(51%)
10.	ask teacher to explain	(42%)	10.	self-questioning	(49%)
11.	summarize the chapter	(41%)	11.	read chapter summary	(46%)
12.	read chapter summary	(37%)	12.	underlining	(45%)
13.	notetaking after reading chapter	(37%)	13.	read the chapter aloud	(42%)
14.	notetaking while reading	(33%)	14.	ask other students to explain	(40%)
15.	ask other students to explain	(32%)	15.	notetaking after reading chapter	(39%)
16.	read other sources	(29%)	16.	notetaking while reading	(37%)
17.	read chapter aloud	(18%)	17.	read other sources	(32%)
18.	construct an outline	(13%)	18.	construct an outline	(24%)

Texas--Part I TABLE 5B

Difference between Biology & +History

1.	Read chapter aloud	(+24%)
2.	Discuss chapter with others	(+16%)
3.	Complete textbook questions/ activities	(+15%)
4.	Reread chapter several times	(+15%)
5.	Summarize the chapter	(+14%)
6.	Memorize portions of chapter	(+12%)
7.	Construct an outline	(+11%)
8.	Ask teacher to explain	(+09%)
9.	Read chapter summary	(+09%)
10.	Review subheadings	(+08%)
11.	Ask other students to explain	(+08%)
12.	Evaluate extent of prior knowledge	(+06%)
13.	Notetaking while reading	(+04%)
14.	Underlining	(+03%)
15.	Self-questioning	(+03%)
16.	Read other sources	(+03%)
17.	Read the chapter through once	(+03%)
18.	Notetaking after reading chapter	(+02%)

TABLE 5C

Texas Students' Responses to Part I: Biology & History

Question	n		Mean		Standard Deviation		1 Never		2 Almost Never		3 Sometimes		4 Almost Always		5 Always	
	B	H	B	H	B	H	B	H	B	H	B	H	B	H	B	H
1. Construct an outline(s) for information in the chapter.	204	71	1.4706	1.7465	.7586	.9669	.67 (137)	.55 (39)	.20 (41)	.21 (15)	.12 (24)	.20 (14)	.005 (1)	.03 (2)	.005 (1)	.01 (1)
2. Take notes while you read the chapter.	204	71	2.0343	2.1831	1.0662	1.2907	.40 (83)	.42 (30)	.27 (54)	.21 (15)	.25 (50)	.21 (15)	.05 (11)	.07 (5)	.03 (6)	.09 (6)
3. Take notes after you read the chapter.	204	71	2.1814	2.1690	1.1708	1.0953	.37 (76)	.37 (26)	.26 (52)	.24 (17)	.25 (50)	.27 (19)	.07 (15)	.11 (8)	.05 (11)	.01 (1)
4. Underline selected ideas in the chapter.	205	70	2.2244	2.2571	1.2120	1.2121	.40 (81)	.39 (27)	.18 (38)	.16 (11)	.27 (55)	.33 (23)	.10 (21)	.07 (5)	.05 (10)	.05 (4)
5. Answer questions and/or complete activities provided in the chapter.	204	70	3.0441	3.5857	1.0088	.9246	.08 (16)	.03 (2)	.17 (34)	.07 (5)	.47 (96)	.33 (23)	.20 (41)	.43 (30)	.08 (17)	.14 (10)
6. Attempt to memorize portions of the chapter.	205	71	2.8341	3.1972	1.2012	1.1417	.18 (37)	.07 (5)	.19 (38)	.18 (13)	.34 (70)	.40 (28)	.20 (42)	.18 (13)	.09 (18)	.17 (12)
7. Read the chapter through only once (without or before engaging any other activities, e.g., notetaking, outlining, underlining).	204	71	3.0147	3.0845	1.1931	1.2041	.12 (25)	.09 (6)	.21 (43)	.27 (19)	.32 (65)	.28 (20)	.23 (46)	.21 (15)	.12 (25)	.15 (11)
8. Reread the chapter several times.	203	70	2.3744	2.6286	1.0567	1.1443	.24 (49)	.21 (15)	.32 (65)	.20 (14)	.28 (57)	.39 (27)	.14 (28)	.14 (10)	.02 (4)	.06 (4)
9. Ask yourself questions about the chapter prior to, during and/or after reading.	205	71	2.4537	2.4789	1.1044	1.0537	.22 (46)	.20 (14)	.32 (65)	.31 (22)	.28 (57)	.35 (25)	.14 (29)	.10 (7)	.04 (3)	.04 (3)

TABLE 5C (continued)

Question	n		Mean		Standard Deviation		1 Never		2 Almost Never		3 Sometimes		4 Almost Always		5 Always	
	B	H	B	H	B	H	B	H	B	H	B	H	B	H	B	H
10. Ask the teacher to explain the entire chapter or portions of it.	205	69	2.2829	2.5797	1.0280	1.1556	.27 (56)	.20 (14)	.31 (63)	.29 (20)	.30 (61)	.29 (20)	.11 (22)	.16 (11)	.01 (3)	.06 (4)
11. Ask other students to explain entire chapter or portions of it.	205	71	1.9707	2.1972	1.0190	.9801	.43 (89)	.30 (21)	.25 (51)	.30 (21)	.24 (49)	.34 (24)	.07 (14)	.05 (4)	.01 (2)	.01 (1)
12. Discuss the entire chapter or portions of it with others.	205	70	2.3122	2.7429	1.0665	1.1633	.28 (57)	.17 (12)	.28 (58)	.23 (16)	.32 (65)	.37 (26)	.09 (19)	.14 (10)	.03 (6)	.09 (6)
13. Read the entire chapter or portions of it aloud.	202	71	1.6832	2.2254	.9561	1.2558	.57 (116)	.42 (30)	.25 (50)	.16 (11)	.11 (22)	.24 (17)	.06 (12)	.14 (10)	.01 (2)	.04 (3)
14. Read a chapter summary before beginning your reading of the chapter.	204	70	2.1569	2.5571	1.1468	1.2469	.38 (78)	.23 (16)	.25 (51)	.31 (22)	.23 (47)	.21 (15)	.10 (21)	.16 (11)	.04 (7)	.09 (6)
15. Review the headings given for chapter subsections before beginning your reading of the chapter.	204	71	2.7059	2.9296	1.2601	1.2686	.20 (42)	.16 (11)	.25 (50)	.21 (15)	.30 (62)	.34 (24)	.13 (26)	.14 (10)	.12 (24)	.15 (11)
16. Read other sources on the topic(s) covered in the chapter.	205	71	2.0927	2.0845	.9682	.9964	.30 (62)	.34 (24)	.41 (84)	.34 (24)	.20 (40)	.24 (17)	.08 (16)	.07 (5)	.01 (3)	.01 (1)
17. Summarize in your own words the chapter or portions of it.	202	71	2.3416	2.6056	1.0823	1.1017	.26 (52)	.18 (13)	.33 (66)	.27 (19)	.26 (53)	.36 (26)	.12 (25)	.13 (9)	.03 (6)	.06 (4)
18. Think about what you do and do not know about the topic before reading the chapter.	202	70	2.4901	2.7000	1.0521	1.2666	.19 (38)	.22 (15)	.33 (66)	.24 (17)	.34 (68)	.27 (19)	.10 (21)	.17 (12)	.04 (9)	.10 (7)

ILLINOIS - PART I

Table 6A

Biology			History		
1.	complete testbook questions/activities	(89%)	1.	memorize portions of chapter	(91%)
2.	discuss chapter with others	(85%)	2.	reread chapter	(86%)
3.	ask teacher to explain	(83%)	3.	discuss chapter with others	(79%)
4.	read chapter through once	(81%)	4.	complete textbook questions/ activities	(77%)
5.	notetaking	(81%)	5.	notetaking	(74%)
6.	memorize portions of chapter	(80%)	6.	self-questioning	(74%)
7.	ask other students to explain	(79%)	7.	ask teacher to explain	(72%)
8.	reread chapter several times	(75%)	8.	read chapter through once	(71%)
9.	self-questioning	(70%)	9.	evaluate extent of prior knowledge	(65%)
10.	summarize the chapter	(63%)	10.	summarize the chapter	(64%)
11.	evaluate extent of prior knowledge	(58%)	11.	read chapter summary	(64%)
12.	read chapter aloud	(55%)	12.	underlining	(61%)
13.	construct an outline	(51.1%)	13.	review subheadings	(61%)
14.	review subheadings	(50%)	14.	construct an outline	(61%)
15.	underlining	(48%)	15.	ask other students to explain	(56%)
16.	read chapter summary	(42%)	16.	read chapter aloud	(42%)
17.	read other sources	(26%)	17.	read other sources	(25%)

Illinois: Part I TABLE 6B

Difference between Biology and History

1.	ask other students to explain	(-23%)
2.	read chapter summary	(+20%)
3.	read chapter aloud	(-13%)
4.	underlining	(+13%)
5.	complete textbook questions/activities	(-12%)
6.	memorize portions of chapter	(+11%)
7.	review subheadings	(+11%)
8.	reread the chapter several times	(+11%)
9.	ask teacher to explain	(-11%)
10.	read chapter through once	(-10%)
11.	construct an outline	(+08.9%)
12.	notetaking	(-07%)
13.	evaluate extent of prior knowledge	(-06%)
14.	discuss chapter with others	(+04%)
15.	self-questioning	(+01%)
16.	summarize the chapter	(+01%)
17.	read other sources	(-01%)

TABLE 6C

Illinois Students' Responses to Part I: Biology & History

Question	Mean[a]		Standard Deviation		1[d]		2		3		4	
	B[b]	H[c]	B	H	B	H	B	H	B	H	B	H
1. Outline the ideas in the chapter	1.5874	1.7892	.6427	.8001	.489 (70)	.40 (83)	.441 (63)	.44 (89)	.063 (9)	.12 (24)	.007 (1)	.04 (8)
2. Take notes from what you have read in the chapter	2.1608	2.0392	.8529	.8295	.19 (28)	.26 (53)	.55 (78)	.51 (103)	.16 (23)	.17 (35)	.10 (14)	.06 (13)
3. Underline important ideas in the chapter	1.7343	1.8529	.9034	.8233	.52 (74)	.39 (79)	.29 (41)	.41 (83)	.14 (20)	.17 (35)	.05 (8)	.03 (7)
4. Summarize in your own words the chapter or parts of it	1.8881	1.8480	.8648	.8011	.37 (53)	.36 (73)	.44 (62)	.48 (99)	.13 (19)	.11 (22)	.06 (9)	.05 (10)
5. Answer the questions given in the text or complete the activities you find included	2.2867	2.0980	.7375	.7880	.11 (16)	.23 (46)	.55 (78)	.49 (100)	.29 (41)	.24 (50)	.05 (8)	.04 (8)
6. Try to memorize important parts of the chapter	2.8462	2.6078	.9443	.9222	.09 (13)	.09 (19)	.26 (37)	.42 (85)	.25 (52)	.28 (57)	.29 (41)	.21 (43)
7. Pause to think about what you do and do not know about the topic of the chapter before you begin to read	1.8182	1.8873	.8528	.8197	.42 (60)	.35 (71)	.39 (56)	.46 (95)	.14 (20)	.14 (28)	.05 (7)	.05 (10)
8. Ask yourself questions about ideas in the chapter.	1.9790	2.0392	.8262	.8295	.30 (43)	.26 (54)	.47 (67)	.49 (100)	.18 (26)	.19 (38)	.05 (7)	.06 (12)
9. Review all the headings given in the chapter before you begin to read the chapter	1.7203	2.0343	.8992	1.0286	.50 (72)	.39 (79)	.35 (50)	.31 (64)	.07 (10)	.18 (36)	.08 (11)	.12 (25)

TABLE 6C (continued)

Question	Mean[a]		Standard Deviation		1[d]		2		3		4	
	B[b]	H[c]	B	H	B	H	B	H	B	H	B	H
10. Read the chapter summary before you begin to read the chapter[e]	1.6713	2.1182	.9625	1.0744	.58 (83)	.36 (73)	.27 (38)	.33 (66)	.05 (8)	.15 (31)	.10 (14)	.16 (33)
11. Read the chapter through only once	2.5105	2.1422	1.0606	.9848	.19 (28)	.29 (60)	.34 (48)	.40 (81)	.23 (33)	.18 (37)	.24 (34)	.13 (26)
12. Reread the chapter several times	2.0420	1.6863	.8125	.8420	.25 (36)	.50 (103)	.51 (73)	.36 (73)	.18 (26)	.08 (17)	.06 (8)	.06 (11)
13. Read the entire chapter or parts of it aloud to yourself	1.7552	1.5588	.8326	.7504	.45 (65)	.58 (118)	.38 (54)	.30 (62)	.13 (18)	.10 (20)	.04 (6)	.02 (4)
14. Ask the teacher to explain the entire chapter or parts of it[e]	2.0490	1.9064	.6748	.7286	.17 (25)	.28 (57)	.63 (90)	.56 (115)	.17 (24)	.12 (24)	.03 (4)	.04 (7)
15. Ask other students to help explain the entire chapter or parts of it	1.9441	1.6569	.6255	.6804	.21 (30)	.44 (90)	.65 (93)	.48 (98)	.13 (18)	.06 (12)	.01 (2)	.02 (4)
16. Discuss the entire chapter or parts of it with others	2.1329	2.0637	.6944	.7946	.15 (21)	.21 (43)	.61 (87)	.59 (120)	.21 (30)	.13 (26)	.03 (5)	.07 (15)
17. Read other books on the topic(s) discussed in the chapter	1.2797	1.2696	.4807	.4971	.74 (105)	.75 (153)	.25 (36)	.235 (48)	.01 (2)	.01 (2)	.00 (0)	.005 (1)

Note. The question was "When you study a chapter in your textbook how often do you use the following methods?"

[a] *N* = 347
[b] *n* = 143, .41
[c] *n* = 204. .59
[d] actual number is in parenthesis
[e] *N* = 346

Texas Part I

TABLE 6F

Difference between History Females and Biology Females

1.	read chapter aloud	(+27%)
2.	discuss chapter aloud	(+25%)
3.	complete chapter questions/activities	(+22%)
4.	construct an outline	+19%)
5.	review subheadings	(+14%)
6.	reread the chapter several times	(+13%)
7.	evaluate extent of prior knowledge	(+12%)
8.	memorize portions of the chapter	(+11%)
9.	reread chapter summary	(+10%)
10.	self-questioning	(+09%)
11.	summarize the chapter	(+09%)
12.	read the chapter through once	(+08%)
13.	ask other students to explain	(+08%)
14.	notetaking while reading	(+05%)
15.	notetaking after reading chapter	(-03%)
16.	underlining	(+03%)
17.	ask the teacher to explain	(+02%)
18.	read other sources	(+01%)

TABLE 7A

Texas Students Response to Part I:

Male & Female

	Male			Female	
1.	complete textbook questions/activities	(80%)	1.	complete textbook questions/activities	(78%)
2.	memorize portions of the chapter	(73%)	2.	read chapter through once	(62%)
3.	read chapter through once	(71%)	3.	memorize portions of the chapter	(61%)
4.	review subheadings	(56%)	4.	review subheadings	(57%)
5.	evaluate extent of prior knowledge	(53%)	5.	reread chapter several times	(52%)
6.	self-questioning	(51%)	6.	underlining	(49%)
7.	summarize the chapter	(43%)	7.	ask teacher to explain	(48%)
8.	reread chapter several times	(43%)	8.	discuss chapter with others	(47%)
9.	ask teacher to explain	(40%)	9.	summarize the chapter	(47%)
10.	notetaking after reading chapter	(39%)	10.	evaluate extent of prior knowledge	(47%)
11.	discuss chapter with others	(39%)	11.	self-questioning	(43%)
12.	underlining	(37%)	12.	read chapter summary	(41%)
13.	read chapter summary	(37%)	13.	notetaking while reading	(39%)
14.	read other sources	(33%)	14.	notetaking after reading chapter	(38%)
15.	ask other students to explain	(30%)	15.	ask other students to explain	(37%)
16.	notetaking while reading	(29%)	16.	read other sources	(27%)
17.	read chapter aloud	(23%)	17.	read chapter aloud	(26%)
18.	construct an outline	(18%)	18.	construct an outline	(14%)

Texas: Part I

TABLE 7B

Difference between Male and Female

1.	Memorize portions of the chapter	(+12%)
2.	underlining	(-12%)
3.	notetaking while reading	(-10%)
4.	read the chapter through once	(+09%)
5.	reread the chapter several times	(-09%)
6.	self-questioning	(+08%)
7.	ask the teacher to explain	(-08%)
8.	discuss the chapter with others	(-08%)
9.	ask other students to explain	(-07%)
10.	read other sources	(+06%)
11.	evaluate extent of prior knowledge	(+06%)
12.	construct an outline	(+04%)
13.	summarize the chapter	(-04%)
14.	read the chapter summary	(-04%)
15.	read the chapter aloud	(-03%)
16.	complete textbook questions.activities	(+02%)
17.	notetaking after reading the chapter	(+01%)
18.	review chapter subheadings	(-01%)

TABLE 7C

Texas Students' Responses to Part I: Male & Female

Question	n		Mean		Standard Deviation		1 Never		2 Almost Never		3 Sometimes		4 Almost Always		5 Always	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1. Construct an outline(s) for information in the chapter.	129	146	1.5581	1.5274	.8188	.8321	.64 (82)	.64 (94)	.18 (24)	.22 (32)	.16 (21)	.12 (17)	.02 (2)	.01 (1)	.00 (0)	.01 (2)
2. Take notes while you read the chapter.	129	146	1.9767	2.1575	1.0859	1.1608	.43 (56)	.39 (57)	.28 (36)	.22 (33)	.20 (26)	.27 (39)	.05 (6)	.07 (10)	.04 (5)	.05 (7)
3. Take notes after you read the chapter.	129	146	2.2016	2.1575	1.1414	1.1608	.34 (45)	.39 (57)	.27 (35)	.23 (34)	.26 (33)	.25 (36)	.08 (10)	.09 (13)	.05 (6)	.04 (6)
4. Underline selected ideas in the chapter.	129	146	2.0775	2.3699	1.1633	1.2374	.45 (58)	.34 (50)	.18 (23)	.17 (26)	.25 (32)	.32 (46)	.09 (12)	.10 (14)	.03 (4)	.07 (10)
5. Answer questions and/or complete activities provided in the chapter.	128	146	3.1719	3.1918	.9890	1.0393	.06 (8)	.07 (10)	.14 (18)	.15 (21)	.44 (57)	.42 (62)	.27 (34)	.25 (37)	.09 (11)	.11 (16)
6. Attempt to memorize portions of the chapter.	130	146	3.0462	2.8219	1.1197	1.2522	.12 (15)	.18 (27)	.15 (20)	.21 (31)	.40 (52)	.32 (46)	.23 (30)	.17 (25)	.10 (13)	.12 (17)
7. Read the chapter through only once (without or before engaging any other activities, e.g., notetaking, outlining, underlining).	129	146	3.0853	2.9863	1.1728	1.2148	.10 (13)	.12 (18)	.19 (24)	.26 (38)	.40 (51)	.23 (34)	.16 (21)	.28 (40)	.15 (20)	.11 (16)
8. Reread the chapter several times.	130	143	2.3615	2.5105	1.1067	1.0606	.25 (33)	.22 (31)	.32 (42)	.26 (37)	.28 (36)	.34 (48)	.10 (13)	.17 (25)	.05 (6)	.01 (2)
9. Ask yourself questions about the chapter prior to, during and/or after reading.	130	146	2.5231	2.4041	.9900	1.1720	.16 (21)	.27 (39)	.33 (43)	.30 (44)	.36 (46)	.25 (36)	.13 (17)	.13 (19)	.02 (3)	.05 (8)

TABLE 7C (continued)

Question	n		Mean		Standard Deviation		1 Never		2 Almost Never		3 Sometimes		4 Almost Always		5 Always	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
10. Ask the teacher to explain the entire chapter or portions of it.	129	145	2.2791	2.4276	.9920	1.1288	.25 (32)	.26 (38)	.35 (45)	.26 (38)	.29 (38)	.30 (43)	.09 (12)	.15 (21)	.02 (2)	.03 (5)
11. Ask other students to explain entire chapter or portions of it.	130	146	1.9462	2.1027	1.0291	.9947	.45 (58)	.36 (52)	.25 (32)	.27 (40)	.25 (32)	.28 (41)	.03 (5)	.09 (13)	.02 (3)	.00 (0)
12. Discuss the entire chapter or portions of it with others.	130	145	2.4000	2.4414	1.0754	1.1358	.25 (33)	.25 (36)	.26 (34)	.28 (40)	.35 (45)	.32 (46)	.11 (14)	.10 (15)	.03 (4)	.05 (8)
13. Read the entire chapter or portions of it aloud.	129	144	1.7519	1.8889	1.0002	1.1226	.55 (72)	.51 (74)	.22 (28)	.23 (33)	.15 (19)	.14 (20)	.07 (9)	.09 (13)	.01 (1)	.03 (4)
14. Read a chapter summary before beginning your reading of the chapter.	129	145	2.1783	2.3310	1.1281	1.2307	.36 (46)	.33 (48)	.27 (35)	.26 (38)	.24 (32)	.21 (30)	.09 (11)	.14 (21)	.04 (5)	.06 (8)
15. Review the headings given for chapter subsections before beginning your reading of the chapter.	129	146	2.7442	2.7808	1.2265	1.2998	.18 (23)	.21 (30)	.26 (33)	.22 (32)	.32 (42)	.30 (44)	.12 (16)	.135 (20)	.12 (15)	.135 (20)
16. Read other sources on the topic(s) covered in the chapter.	130	146	2.1385	2.0479	.9785	.9708	.30 (39)	.32 (47)	.37 (48)	.41 (60)	.23 (30)	.19 (27)	.09 (12)	.06 (9)	.01 (1)	.02 (3)
17. Summarize in your own words the chapter or portions of it.	128	145	2.3359	2.4759	.9982	1.1672	.22 (29)	.25 (36)	.35 (45)	.28 (40)	.30 (38)	.28 (41)	.11 (14)	.14 (20)	.02 (2)	.05 (8)
18. Think about what you do and do not know about the topic before reading the chapter.	128	144	2.5703	2.5208	1.1342	1.0965	.20 (26)	.19 (27)	.27 (34)	.34 (49)	.36 (46)	.28 (41)	.10 (13)	.14 (20)	.07 (9)	.05 (7)

Texas Part I

TABLE 7D

Biology

Difference between Males and Females

1.	read chapter through once	(+16%)
2.	memorize portions of the chapter	(+13%)
3.	underlinign	(-11%)
4.	reread chapter several times	(-11%)
5.	self-questioning	(+11%)
6.	ask teacher to explain	(-11%)
7.	construct an outline	(+10%)
8.	notetaking while reading	(-09%)
9.	evaluate extent of prior knowledge	(+09%)
10.	complete textbook questions/ activities	(+07%)
11.	ask other students to explain	(-07%)
12.	discuss chapter with others	(+07%)
13.	summarize the chapter	(-07%)
14.	read other sources	(+04%)
15.	notetaking after reading chapter	(-03%)
16.	read chapter summary	(-03%)
17.	review subheadings	(+03%)
18.	read chapter aloud	(-01%)

Texas Part I TABLE 7E

History

Difference between Males and Females

1.	memorize portions of the chapter	(+16%)
2.	discuss the chapter with others	(-14%)
3.	notetaking while reading	(-13%)
4.	notetaking after reading chapter	(+10%)
5.	complete chapter questions/activities	(-10%)
6.	read other sources	(+10%)
7.	underlining	(-09%)
8.	review subheadings	(-09%)
9.	construct an outline	(-07%)
10.	reread the chapter several times	(-07%)
11.	read the chapter through once	(-06%)
12.	read the chapter aloud	(-06%)
13.	ask the teacher to explain	(+05%)
14.	read chapter summary	(-05%)
15.	ask other students to explain	(-04%)
16.	evaluate extent of prior knowledge	(-04%)
17.	self-questioning	(-02%)
18.	summarize the chapter	(+01%)

Texas Part I TABLE 7F

Difference between History Males and Biology Males

1.	read the chapter aloud	(+22%)
2.	ask the teacher to explain	(+18%)
3.	reread the chapter several times	(+17%)
4.	summarize the chapter	(+17%)
5.	memorize portions of the chapter	(-14%)
6.	read the chapter through once	(-14%)
7.	ask other students to explain	(+11%)
8.	notetaking after reading the chapter	(+10%)
9.	read chapter summary	(+08%)
10.	read other sources	(+07%)
11.	underlining	(+05%)
12.	complete textbook questions/activities	(+05%)
13.	self-questioning	(-04%)
14.	discuss the chapter with others	(+04%)
15.	construct an outline	(+02%)
16.	review subheadings	(+02%)
17.	notetaking while reading	(+01%)
18.	evaluate extent of prior knowledge	(-01%)

Illinois

TABLE 8A

	MALE			FEMALE	
1.	memorize portions of chapter	(90%)	1.	memorize portions of chapter	(91%)
2.	complete textbook questions/activities	(82%)	2.	discuss chapter with others	(86%)
3.	read chapter through once	(82%)	3.	complete textbook questions/activities	(83%)
4.	discuss chapter with others	(76%)	4.	notetaking	(79%)
5.	notetaking	(74%)	5.	ask teacher to explain	(79%)
6.	self-questioning	(73%)	6.	read chapter through once	(73%)
7.	ask teacher to explain	(73%)	7.	ask other students to explain	(72%)
8.	summarize the chapter	(65%)	8.	self-questioning	(72%)
9.	evaluate extent of prior knowledge	(61%)	9.	evaluate extent of prior knowledge	(63%)
10.	read chapter summary	(59%)	10.	summarize chapter	(62%)
11.	ask other students to explain	(59%)	11.	reread chapter	(62%)
12.	reread the chapter several times	(58%)	12.	underlining	(59%)
13.	construct an outline	(58%)	13.	read chapter aloud	(58%)
14.	review subheadings	(56%)	14.	review subheadings	(57%)
15.	underlining	(52%)	15.	construct an outline	(54%)
16.	read chapter aloud	(34%)	16.	read chapter summary	(51%)
17.	read other sources	(33.3%)	17.	read other sources	(18.7%)

Illinois TABLE 8B

Difference between Male and Female

1.	read chapter aloud	(+24%)
2.	read other sources	(-14.6%)
3.	ask other students to explain	(+13%)
4.	discuss chapter with others	(+10%)
5.	read chapter summary	(-08%)
6.	underlining	(+07%)
7.	ask teacher to explain	(+06%)
8.	notetaking	(-05%)
9.	reread chapter several times	(+04%)
10.	construct an outline	(-04%)
11.	read chapter through once	(-03%)
12.	summarize the chapter	(-03%)
13.	evaluate extent of prior knowledge	(+02%)
14.	complete textbook questions/activities	(+01%)
15.	memorize portions of chapter	(+01%)
16.	self-questioning	(-01%)
17.	review subheadings	(+01%)

TABLE 8C

Illinois Students' Responses to Part I: Male & Female

Question	Mean[a]		Standard Deviation		1[d]		2		3		4	
	M[b]	F[c]	M	F	M	F	M	F	M	F	M	F
1. Outline the ideas in the chapter	1.6970	1.7143	.7108	.7765	.42 (70)	.46 (83)	.48 (79)	.40 (73)	.07 (12)	.11 (21)	.03 (4)	.03 (5)
2. Take notes from what you have read in the chapter	2.0121	2.1593	.7885	.8807	.26 (43)	.21 (38)	.51 (84)	.53 (97)	.19 (31)	.15 (27)	.04 (7)	.11 (20)
3. Underline important ideas in the chapter	1.6970	1.9011	.7842	.9110	.48 (79)	.41 (74)	.37 (61)	.35 (63)	.13 (21)	.18 (34)	.02 (4)	.06 (11)
4. Summarize in your own words the chapter or parts of it	1.9273	1.8077	.8594	.7946	.35 (57)	.38 (69)	.44 (73)	.48 (88)	.15 (25)	.09 (16)	.06 (10)	.05 (9)
5. Answer the questions given in the text or complete the activities you find included	2.1515	2.1978	.7778	.7684	.18 (30)	.17 (32)	.54 (89)	.49 (89)	.22 (37)	.30 (54)	.06 (9)	.04 (7)
6. Try to memorize important parts of the chapter	2.6970	2.7143	.9333	.9436	.10 (16)	.09 (16)	.34 56)	.36 (66)	.33 (55)	.30 (54)	.23 (38)	.25 (46)
7. Pause to think about what you do and do not know about the topic of the chapter before you begin to read	1.8061	1.9066	.7801	.8776	.39 (64)	.37 (67)	.45 (74)	.42 (77)	.13 (22)	.14 (26)	.03 (5)	.07 (12)
8. Ask yourself questions about ideas in the chapter.	2.0061	2.0220	.8077	.8472	.27 (45)	.28 (52)	.50 (82)	.47 (85)	.18 (30)	.19 (34)	.05 (8)	.06 (11)
9. Review all the headings given in the chapter before you begin to read the chapter	1.9091	1.9011	1.0050	.9754	.44 (73)	.43 (78)	.32 (52)	.34 (62)	.13 (22)	.13 (24)	.11 (18)	.10 (18)

TABLE 8C (continued)

Question	Mean[a]		Standard Deviation		1[d]		2		3		4	
	M[b]	F[c]	M	F	M	F	M	F	M	F	M	F
10. Read the chapter summary *before* you begin to read the chapter[e]	2.0061	1.8681	1.0538	1.0481	.41 (67)	.49 (89)	.32 (52)	.29 (52)	.13 (22)	.09 (17)	.14 (23)	.13 (24)
11. Read the chapter through only once	2.3939	2.2033	1.0689	.9402	.24 (39)	.27 (49)	.35 (57)	.39 (72)	.20 (34)	.20 (36)	.21 (35)	.14 (25)
12. Reread the chapter several times	1.7818	1.8791	.8269	.8647	.42 (69)	.38 (70)	.44 (72)	.41 (74)	.09 (15)	.15 (28)	.05 (9)	.06 (10)
13. Read the entire chapter or parts of it aloud to yourself	1.4424	1.8187	.6839	.8377	.66 (108)	.41 (75)	.26 (43)	.40 (73)	.07 (12)	.14 (26)	.01 (2)	.04 (8)
14. Ask the teacher to explain the entire chapter or parts of it[e]	1.9091	2.0166	.7055	.7108	.27 (45)	.21 (37)	.57 (94)	.61 (111)	.13 (22)	.14 (26)	.03 (4)	.04 (7)
15. Ask other students to help explain the entire chapter or parts of it	1.7152	1.8297	.7054	.6382	.41 (68)	.28 (52)	.48 (79)	.62 (112)	.09 (15)	.08 (15)	.02 (3)	.02 (3)
16. Discuss the entire chapter or parts of it with others	2.0121	2.1648	.7570	.7472	.24 (39)	.14 (25)	.56 (92)	.63 (115)	.16 (27)	.16 (29)	.04 (7)	.07 (13)
17. Read other books on the topic(s) discussed in the chapter	1.3636	1.1923	.5532	.4089	.667 (110)	.813 (148)	.309 (51)	.181 (33)	.018 (3)	.006 (1)	.006 (1)	.00 (0)

Note. The question was "When you study a chapter in your textbook how often do you use the following methods?"

[a] *N* = 347
[b] *n* = 164, .48
[c] *n* = 182, .52
[d] actual number is in parenthesis
[e] *N* = 346

llinois: Part I TABLE 8D

Biology

Difference between Male and Female

1.	read chapter aloud	(-28%)
2.	underlining	(-11%)
3.	summarize the chapter	(+11%)
4.	read other sources	(+10%)
6.	discuss chapter with others	(-08%)
7.	reread the chapter several times	(+07%)
8.	self-questioning	(+05%)
9.	review subheadings	(-05%)
10.	read chapter summary	(+05%)
11.	construct an outline	(+04%)
12.	memorize protions of the chapter	(-04%)
13.	complete textbook questions/activities	(-03%)
14.	evaluate extent of prior knowledge	(-03%)
15.	read chapter through once	(+03%)
16.	ask other students to explain	(-03%)
17.	ask teacher to explain	(+02%)

Illinois: Part I

TABLE 8E

History

Difference between Male and Female

1.	read chapter aloud	(-21%)
2.	read other sources	(+18%)
3.	ask other students to explain	(-16%)
4.	ask teacher to explain	(-12%)
5.	discuss chapter with others	(-10%)
6.	reread the chapter several times	(-08%)
7.	read chapter summary	(+07%)
8.	underlining	(-06%)
9.	read chapter through once	(+05%)
10.	notetaking	(-04%)
11.	complete textbook questions/activities	(+03%)
12.	construct an outline	(+02%)
13.	summarize the chapter	(-02%)
14.	evaluate extent of prior knowledge	(-02%)
15.	memorize portions of the chapter	(+01%)
16.	self-questioning	(-01%)
17.	review subheadings	(-01%)

Illinois: Part I TABLE 8F

Difference between History Males and Biology Males

1.	reread the chapter several times	(-33%)
2.	ask other students to explain	(-29%)
3.	read chapter summary	(+23%)
4.	ask teacher to explain	(-18%)
5.	underlining	(+16%)
6.	review subheadings	(+14%)
7.	read chapter through once	(-09%)
8.	complete textbook questions/activities	(-08%)
9.	evaluate extent of prior knowledge	(+08%)
10.	construct an outline	(+07%)
11.	read chapter aloud	(-07%)
12.	discuss chapter with others	(-07%)
13.	summarize the chapter	(-06%)
14.	notetaking	(-05%)
15.	memorize portions of the chapter	(+02%)
16.	read other sources	(+02%)
17.	self-questioning	(00%)

Illinois Part I TABLE 8G

Difference between History Females and Biology Females

1.	read chapter summary	(+21%)
2.	reread the chapter several times	(-18%)
3.	ask other students to explain	(-16%)
4.	complete textbook questions/activities	(-14%)
5.	read chapter aloud	(-14%)
6.	underlining	(+11%)
7.	read chapter through once	(-11%)
8.	review subheadings	(+10%)
9.	construct an outline	(+09%)
10.	notetaking	(-09%)
11.	summarize the chapter	(+07%)
12.	evaluate extent of prior knowledge	(+07%)
13.	self-questioning	(+06%)
14.	read other sources.	(-06%)
15.	discuss the chapter with others	(-05%)
16.	ask teacher to explain	(-04%)
17.	memorize portions of the chapter	(-03%)

Texas Table 9A

Collapsed Frequency of Students' Responses to Survey: Part II

1.	important ideas not clearly pointed out	(63%)
2.	not enough examples or clarification of key ideas	(63%)
3.	good summary of chapter not included	(62%)
4.	students expected to know more than they do	(60%)
5.	text out-of-date	(57%)
6.	ideas not related to what students may already know	(56%)
7.	topic not covered in as much detail as needed	(56%)
8.	important relationship between ideas not pointed out	(55%)
9.	vocabulary difficult to understand	(53%)
10.	more detail included than necessary	(53%)
11.	insufficient introductory or background information	(52%)
12.	text written in a way which is difficult to follow	(41%)
13.	irrelevant information included	(34%)

TABLE 9B

Question	N	Mean	Standard Deviation	1 Never	2 Almost Never	3 Sometimes	4 Almost Always	5 Always
1. The text uses vocabulary which is difficult to understand.	275	2.5236	.9715	.17 (47)	.30 (81)	.39 (107)	.13 (36)	.01 (4)
2. The text does not clearly point out the main ideas.	273	2.7802	.9331	.08 (23)	.29 (78)	.42 (116)	.18 (48)	.03 (8)
3. The text expects you to know more about what you are reading than you do.	276	2.7609	1.0825	.14 (39)	.26 (71)	.35 (97)	.20 (55)	.05 (14)
4. The text does not provide enough examples or clarification of key ideas.	276	2.7754	1.0056	.12 (33)	.25 (70)	.39 (107)	.21 (58)	.03 (8)
5. The text is poorly organized--that is, the text is written in a way which is difficult to follow.	275	2.4000	1.0288	.19 (52)	.40 (109)	.28 (78)	.09 (24)	.04 (12)
6. The text does not provide sufficient introductory or background information before presenting new ideas.	275	2.5564	1.0070	.15 (43)	.33 (91)	.34 (93)	.15 (41)	.03 (7)
7. The text does not attempt to relate ideas to what you already know about the topic.	271	2.6716	1.0642	.15 (40)	.29 (79)	.35 (95)	.16 (44)	.05 (13)
8. The text is out-of-date--that is, the text does not discuss current issues.	274	2.7482	1.1977	.18 (49)	.25 (68)	.30 (84)	.18 (49)	.09 (24)

TABLE 9B (continued)

Question	N	Mean	Standard Deviation	1 Never	2 Almost Never	3 Sometimes	4 Almost Always	5 Always
9. The text presents irrelevant information which is not related to the purpose for which the text is intended.	275	2.1927	.9335	.24 (66)	.42 (116)	.27 (73)	.05 (14)	.02 (6)
10. The text does not point out important relationships between key ideas.	275	2.6218	.9679	.12 (34)	.33 (90)	.38 (105)	.14 (38)	.03 (8)
11. The text does not include a good summary of the chapter.	272	2.9375	1.2566	.16 (44)	.22 (58)	.27 (74)	.23 (63)	.12 (33)
12. The text does not cover as much of the topic as the teacher expects you to know.	276	2,7101	1.1952	.19 (52)	.25 (69)	.31 (85)	.17 (47)	.08 (23)
13. The text goes into more detail than is appropriate for your purposes.	276	2.5978	1.0793	.17 (46)	.30 (82)	.37 (103)	.10 (27)	.06 (18)

Illinois

TABLE 10A

1.	important ideas not clearly pointed out	(80%)
2.	vocabulary difficult to understand	(79%)
3.	students expected to know more than they do	(78%)
4.	ideas not related to what students may already know	(77%)
5.	not enough examples	(75%)
6.	topic not covered in as much detail as needed	(75%)
7.	irrelevant information included	(75%)
8.	relationships between important ideas not pointed out	(68%)
9.	good chapter summary not included	(68%)
10.	insufficient introductory or background information	(67%)
11.	ideas organized in a way which is difficult to follow	(66%)
12.	text out-of-date	(51%)

TABLE 10B

Question	Mean	Standard Deviation	1	2	3	4
			never a problem	sometimes a problem	almost always a problem	always a problem
1. The text uses words which are difficult to understand	1.9424	.6425	.21 (73)	.66 (230)	.10 (35)	.03 (9)
2. The text does not tell you which ideas in the chapter are important; that is, which ideas you should remember	2.2334	.8997	.20 (71)	.47 (162)	.22 (76)	.11 (38)
3. The text does not tell you how one important idea is related to another important idea	2.1470	.8560	.22 (77)	.49 (170)	.21 (72)	.08 (28)
4. The text does not explain how new ideas are related to things you already know	2.1647	.8807	.23 (79)	.47 (162)	.21 (74)	.09 (31)
5. The text organizes ideas in a way which is difficult to follow	1.8790	.8063	.34 (119)	.49 (168)	.12 (43)	.05 (17)
6. The text does not include enough background information before it discusses new ideas	1.8613	.7715	.33 (116)	.51 (176)	.12 (40)	.04 (14)

TABLE 10B (continued)

Question	Mean	Standard Deviation	1 never a problem	2 sometimes a problem	3 almost always a problem	4 always a problem
7. The text does not include enough examples to help you understand new ideas	2.0145	.7782	.25 (86)	.53 (185)	.17 (59)	.05 (16)
8. The text does not include a good summary of the important ideas in the chapter	2.0720	.9635	.32 (111)	.40 (138)	.17 (60)	.11 (38)
9. The text expects you to know more about what you are reading than you usually do	2.2939	.9647	.22 (75)	.42 (145)	.22 (77)	.14 (50)
10. The text does not discuss as many of the ideas as the teacher expects you to know	2.1816	.9489	.25 (86)	.45 (156)	.17 (61)	.13 (44)
11. The text spends too much time discussing ideas the teacher does not expect you to know	2.0576	.8446	.25 (87)	.52 (180)	.15 (53)	.08 (27)
12 The text is out-of-date--that is, the text does not discuss current issues	1.7205	.8929	.49 (171)	.38 (131)	.05 (16)	.08 (29)

Texas

TABLE 11A

	BIOLOGY			HISTORY	
1.	students expected to know more than they do	(65%)	1.	not enough examples or clarification of key ideas	(64%)
2.	good chapter summary not included	(64%)	2.	text out-of-date	(64%)
3.	important ideas not clearly pointed out	(63%)	3.	important ideas not clearly pointed out	(62%)
4.	not enough examples or clarification of key ideas	(62%)	4.	good chapter summary not included	(58%)
5.	vocabulary difficult to understand	(59%)	5.	topics not covered in as much detail as needed	(56%)
6.	ideas not related to what students may already know	(57%)	6.	ideas not related to what students may already know	(55%)
7.	relationships between important ideas not pointed out	(57%)	7.	relationships between important ideas not pointed out	(50%)
8.	more detail included than necessary	(57%)	8.	students expected to know more than they do	(48%)
9.	topics not covered in as much detail as needed	(56%)	9.	more detail included than necessary	(42%)
10.	insufficient introductory or background information	(55%)	10.	insufficient introductory or background information	(41%)
11.	text out-of-date	(55%)	11.	vocabulary difficult to understand	(36%)
12.	text written in a way which is difficult to follow	(45%)	12.	irrelevant information included	(30%)
13.	irrelevant information included	(35%)	13.	text written in a way which is difficult to follow	(29%)

Texas

TABLE 11B

Difference between Biology and History

1.	vocabulary difficult to understand	(-23%)
2.	students expected to know more than they do	(-17%)
3.	text written in a way which is difficult to follow	(-16%)
4.	more detail included than necessary	(-15%)
5.	insufficient introductory or background information	(-14%)
6.	text out-of-date	(+09%)
7.	relationships between important ideas not pointed out	(-07%)
8.	good chapter summary not included	(-06%)
9.	irrelevant information included	(-05%)
10.	not enough examples or clarification of key ideas	(+02%)
11.	ideas not related to what students may already know	(-02%)
12.	important ideas not clearly pointed out	(-01%)
13.	topics not covered in as much detail as needed	(00%)

TABLE 11C

Question	n		Mean		Standard Deviation		1 Never		2 Almost Never		3 Sometimes		4 Almost Always		5 Always	
	B	H	B	H	B	H	B	H	B	H	B	H	B	H	B	H
1. The text uses vocabulary which is difficult to understand.	204	71	2.6471	2.1690	.9379	.9854	.13 (26)	.30 (21)	.28 (57)	.34 (24)	.42 (87)	.28 (20)	.15 (31)	.07 (5)	.02 (3)	.01 (1)
2. The text does not clearly point out the main ideas.	203	70	2.8276	2.6429	.9465	.8852	.08 (15)	.11 (8)	.29 (59)	.27 (19)	.40 (82)	.49 (34)	.20 (40)	.12 (8)	.03 (7)	.01 (1)
3. The text expects you to know more about what you are reading than you do.	205	71	2.8390	2.5352	1.0839	1.0533	.13 (27)	.17 (12)	.22 (46)	.35 (25)	.38 (77)	.28 (20)	.21 (43)	.17 (12)	.06 (12)	.03 (2)
4. The text does not provide enough examples or clarification of key ideas.	205	71	2.7415	2.8732	1.0080	.9990	.14 (28)	.07 (5)	.24 (49)	.29 (21)	.39 (80)	.38 (27)	.21 (44)	.20 (14)	.02 (4)	.06 (4)
5. The text is poorly organized--that is, the text is written in a way which is difficult to follow.	204	71	2.4902	2.1408	1.0481	.9304	.17 (34)	.26 (18)	.38 (77)	.45 (32)	.31 (63)	.21 (15)	.09 (19)	.07 (5)	.05 (11)	.01 (1)
6. The text does not provide sufficient introductory or background information before presenting new ideas.	205	70	2.6098	2.4000	1.0068	.9985	.15 (31)	.17 (12)	.30 (62)	.42 (29)	.35 (72)	.30 (21)	.18 (36)	.07 (5)	.02 (4)	.04 (3)
7. The text does not attempt to relate ideas to what you already know about the topic.	202	69	2.6931	2.6087	1.0949	.9734	.15 (31)	.13 (9)	.28 (57)	.32 (22)	.34 (68)	.39 (27)	.17 (35)	.13 (9)	.06 (11)	.03 (2)
8. The text is out-of-date--that is, the text does not discuss current issues.	205	69	2.6732	2.9710	1.1400	1.3391	.17 (35)	.20 (14)	.28 (57)	.16 (11)	.33 (68)	.23 (16)	.15 (30)	.28 (19)	.07 (15)	.13 (9)

TABLE 11C (continued)

Questions	n		Mean		Standard Deviation		1 Never		2 Almost Never		3 Sometimes		4 Almost Always		5 Always	
	B	H	B	H	B	H	B	H	B	H	B	H	B	H	B	H
9. The text presents irrelevant information which is not related to the purpose for which the text is intended.	205	70	2.2195	2.1143	.9679	.8261	.24 (50)	.23 (16)	.41 (83)	.47 (33)	.26 (54)	.27 (19)	.06 (13)	.015 (1)	.03 (5)	.015 (1)
10. The text does not point out important relationships between key ideas.	204	71	2.6471	2.5493	.9689	.9679	.12 (25)	.13 (9)	.31 (64)	.37 (26)	.38 (78)	.38 (27)	.16 (32)	.08 (6)	.03 (5)	.04 (3)
11. The text does not include a good summary of the chapter.	203	69	2.9606	2.8696	1.2580	1.2592	.16 (33)	.16 (11)	.20 (40)	.26 (18)	.28 (57)	.25 (17)	.24 (48)	.22 (15)	.12 (25)	.11 (8)
12. The text does not cover as much of the topic as the teacher expects you to know.	205	71	2.6829	2.7887	1.1807	1.2411	.19 (40)	.17 (12)	.25 (50)	.27 (19)	.32 (65)	.28 (20)	.17 (35)	.17 (12)	.07 (15)	.11 (8)
13. The text goes into more detail than is appropriate for your purposes.	205	71	2.6927	2.3239	1.1150	.9223	.16 (32)	.20 (14)	.27 (55)	.38 (27)	.38 (79)	.34 (24)	.11 (22)	.07 (5)	.08 (17)	.01 (1)

Illinois

TABLE 12A

BIOLOGY			HISTORY		
1.	vocabulary difficult to understand	(90%)	1.	important ideas not clearly pointed out	(83%)
2.	student expected to know more than they do	(83%)	2.	relationships between important ideas not pointed out	(79%)
3.	more information included than necessary	(81%)	3.	ideas not related to what students may already know	(78%)
4.	relationships between important ideas not pointed out	(76%)	4.	not enough examples	(76%)
5.	ideas not related to what students may already know	(76%)	5.	topics not covered in as much detail as needed	(76%)
6.	important ideas not clearly pointed out	(75%)	6.	student expected to know more than they do	(75%)
7.	topics not covered in as much detail as needed	(74%)	7.	vocabulary difficult to understand	(71%)
8.	not enough examples	(74%)	8.	more information included than necessary	(71%)
9.	insufficient background information	(71%)	9.	good chapter summary not included	(67%)
10.	good chapter summary not included	(70%)	10.	ideas organized in a way which is difficult to follow	(64%)
11.	ideas organized in a way which is difficult to follow	(68%)	11.	insufficient background information	(63%)
12.	text is out-of-date	(54%)	12.	text out-of-date	(48%)

Illinois

TABLE 12B

Difference between Biology and History

1.	vocabulary difficult to understand	(-19%)
2.	more information included than necessary	(-10%)
3.	student expected to know more than they do	(-08%)
4.	important ideas not clearly pointed out	(+08%)
5.	insufficient background information	(-08%)
6.	text out-of-date	(-06%)
7.	ideas organized in a way which is difficult to follow	(-04%)
8.	good chapter summary not included	(-03%)
9.	relationships between important ideas not pointed out	(+03%)
10.	ideas not related to what students already know	(+02%)
11.	not enough examples	(+02%)
12.	topics not covered in as much detail as needed	(+02%)

TABLE 12C

Question	Mean		Standard Deviation		1 never a problem		2 sometimes a problem		3 almost always a problem		4 always a problem	
	B	H	B	H	B	H	B	H	B	H	B	H
1. The text uses words which are difficult to understand	2.0350	1.8775	.5362	.7016	.10 (15)	.29 (58)	.78 (111)	.58 (119)	.10 (14)	.10 (21)	.02 (3)	.03 (6)
2. The text does not tell you which ideas in the chapter are important; that is, which ideas you should remember	2.1538	2.2892	.8826	.9095	.24 (34)	.18 (37)	.46 (65)	.48 (97)	.21 (32)	.22 (44)	.08 (12)	.13 (26)
3. The text does not tell you how one important idea is related to another important idea	2.0839	2.1912	.8179	.8810	.24 (35)	.21 (42)	.48 (68)	.50 (102)	.23 (33)	.19 (39)	.05 (7)	.10 (21)
4. The text does not explain how new ideas are related to things you already know	2.0769	2.2266	.8229	.9162	.24 (34)	.22 (45)	.51 (73)	.44 (89)	.19 (27)	.23 (47)	.06 (9)	.11 (22)
5. The text organizes ideas in a way which is difficult to follow	1.8322	1.9118	.7119	.8665	.32 (46)	.36 (73)	.55 (79)	.44 (89)	.10 (14)	.14 (29)	.03 (4)	.06 (13)
6. The text does not include enough background information before it discusses new ideas	1.9371	1.8079	.7619	.7756	.29 (41)	.37 (75)	.53 (75)	.50 (101)	.15 (22)	.09 (18)	.03 (5)	.04 (9)

TABLE 12C (continued)

Question	Mean		Standard Deviation		1 never a problem		2 sometimes a problem		3 almost always a problem		4 always a problem	
	B	H	B	H	B	H	B	H	B	H	B	H
7. The text does not include enough examples to help you understand new ideas	1.9580	2.0542	.7108	.8217	.26 (37)	.24 (49)	.54 (77)	.53 (108)	.19 (27)	.16 (32)	.01 (2)	.07 (14)
8. The text does not include a good summary of the important ideas in the chapter	2.0490	2.0882	.9064	1.0035	.30 (43)	.33 (68)	.43 (62)	.37 (76)	.18 (26)	.17 (34)	.09 (12)	.13 (26)
9. The text expects you to know more about what you are reading than you usually do	2.3706	2.2402	.9320	.9857	.17 (25)	.25 (50)	.42 (60)	.41 (85)	.27 (38)	.19 (39)	.14 (20)	.15 (30)
10. The text does not discuss as many of the ideas as the teacher expects you to know	2.1189	2.2255	.9306	.9614	.26 (37)	.24 (49)	.48 (69)	.43 (87)	.14 (20)	.20 (41)	.12 (17)	.13 (27)
11. The text spends too much time discussing ideas the teacher does not expect you to know	2.1049	2.0245	.7572	.9012	.19 (27)	.29 (60)	.57 (81)	.49 (99)	.19 (28)	.12 (25)	.05 (7)	.10 (20)
12. The text is out-of-date--that is, the text does not discuss current issues	1.6084	1.7990	.6611	1.0189	.46 (66)	.52 (105)	.50 (71)	.29 (60)	.01 (2)	.07 (14)	.03 (4)	.12 (25)

Table 13A

	MALE			FEMALE	
1.	not enough examples or clarification of ideas	(62%)	1.	students expected to know more than they do.	(68%)
2.	important ideas not clearly pointed out	(60%)	2.	good chapter summary not included	(65%)
3.	good chapter summary not included	(60%)	3.	important ideas not clearly pointed out	(65%)
4.	more detail included than necessary	(59%)	4.	not enough examples or clarification of ideas	(63%)
5.	topic's not covered in as much detail as needed	(57%)	5.	text out-of-date	(62%)
6.	text is out-of-date	(52%)	6.	vocabulary difficult to understand	(60%)
7.	ideas not related to what students may already know	(51%)	7.	ideas not related to what students may already know	(60%)
8.	relationships between important ideas not pointed out	(51%)	8.	relationships between important ideas not pointed out	(58%)
9.	students expected to know more than they do	(50%)	9.	insufficient introductory or background information	(57%)
10.	vocabulary difficult to understand	(46%)	10.	this not covered in as much detail as needed	(56%)
11.	insufficient introductory or background information.	(45%)	11.	more detail included than necessary	(49%)
12.	written in a way which is difficult to follow	(42%)	12.	text written in a way which is difficult to follow	(40%)
13.	irrelevant information included	(36%)	13.	irrelevant information included	(32%)

Texas

Table 13B

Difference between male & female

1.	students expected to know more than they do	(-18%)
2.	vocabulary difficult to understand	(-14%)
3.	insufficient introductory or background information	(-12%)
4.	text out-of-date	(-10%)
5.	more detail included than necessary	(+10%)
6.	ideas not related to what students may already know	(-09%)
7.	relationships between important ideas not pointed out	(-07%)
8.	important ideas not clearly pointed out	(-05%)
9.	good chapter summary not included	(-05%)
10.	irrelevant information included	(+04%)
11.	text written in a way which is difficult to follow	(+02%)
12.	not enough examples or clarification of ideas	(-01%)
13.	topics not covered in as much detail as needed	(+01%)

TABLE 13C

Question	n		Mean		Standard Deviation		1 Never		2 Almost Never		3 Sometimes		4 Almost Always		5 Always	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M.	F
1. The text uses vocabulary which is difficult to understand.	129	146	2.3643	2.6644	.9677	.9561	.21 (28)	.13 (19)	.33 (42)	.27 (39)	.34 (44)	.43 (63)	.11 (14)	.15 (22)	.01 (1)	.02 (3)
2. The text does not clearly point out the main ideas.	127	146	2.6850	2.8630	.8329	1.0078	.07 (9)	.10 (14)	.33 (42)	.25 (36)	.45 (57)	.40 (59)	.14 (18)	.21 (30)	.01 (1)	.04 (7)
3. The text expects you to know more about what you are reading than you do.	130	146	2.5462	2.9521	1.0351	1.0912	.17 (22)	.12 (17)	.33 (43)	.20 (28)	.31 (40)	.39 (57)	.17 (22)	.22 (33)	.02 (3)	.07 (11)
4. The text does not provide enough examples or clarification of key ideas.	130	146	2.7154	2.8288	.9979	1.0127	.14 (18)	.10 (15)	.24 (31)	.27 (39)	.42 (54)	.36 (53)	.18 (24)	.23 (34)	.02 (3)	.04 (5)
5. The text is poorly organized--that is, the text is written in a way which is difficult to follow.	129	146	2.4031	2.3973	1.0195	1.0404	.19 (24)	.19 (28)	.39 (50)	.41 (59)	.31 (40)	.26 (38)	.07 (9)	.10 (15)	.04 (6)	.04 (6)
6. The text does not provide sufficient introductory or background information before presenting new ideas.	130	145	2.4615	2.6414	1.0429	.9695	.18 (24)	.13 (19)	.37 (48)	.30 (43)	.28 (36)	.39 (57)	.14 (18)	.16 (23)	.03 (4)	.02 (3)
7. The text does not attempt to relate ideas to what you already know about the topic.	128	143	2.6094	2.7273	1.0812	1.0494	.16 (20)	.14 (20)	.33 (42)	.26 (37)	.32 (41)	.38 (54)	.14 (18)	.18 (26)	.05 (7)	.04 (6)
8. The text is out-of-date--that is, the text does not discuss current issues.	129	145	2.6667	2.8207	1.1880	1.2057	.18 (23)	.18 (26)	.30 (39)	.20 (29)	.28 (36)	.33 (48)	.16 (20)	.20 (29)	.08 (11)	.09 (13)

TABLE 13C (continued)

Questions	n		Mean		Standard Deviation		1 Never		2 Almost Always		3 Sometimes		4 Almost Always		5 Always	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
9. The text presents irrelevant information which is not related to the purpose for which the text is intended.	130	145	2.2308	2.1586	.9445	.9255	.23 (30)	.25 (36)	.41 (53)	.43 (63)	.29 (37)	.25 (36)	.05 (7)	.05 (7)	.02 (3)	.02 (3)
10. The text does not point out important relationships between key ideas.	130	145	2.5615	2.6759	.8892	1.0334	.10 (13)	.15 (21)	.39 (51)	.27 (39)	.37 (48)	.39 (57)	.12 (16)	.15 (22)	.02 (2)	.04 (6)
11. The text does not include a good summary of the chapter.	129	143	2.7907	3.0699	1.2098	1.2873	.18 (23)	.15 (21)	.22 (29)	.20 (29)	.32 (41)	.23 (33)	.19 (24)	.27 (39)	.09 (12)	.15 (21)
12. The text does not cover as much of the topic as the teacher expects you to know.	130	146	2.7538	2.6712	1.2076	1.1868	.18 (23)	.20 (29)	.25 (33)	.24 (36)	.30 (39)	.32 (46)	.18 (23)	.16 (24)	.09 (12)	.08 (11)
13. The text goes into more detail than is appropriate for your purposes.	130	146	2.7231	2.4863	1.0998	1.0520	.15 (19)	.18 (27)	.26 (34)	.33 (48)	.39 (51)	.36 (52)	.12 (16)	.08 (11)	.08 (10)	.05 (8)

Table 13D

Texas

BIOLOGY

Difference between male & female

1.	students expected to know more than they do	(-28%)
2.	vocabulary difficult to understand	(-16%)
3.	insufficient introduction or background information	(-13%)
4.	ideas not related to what students may already know	(-10%)
5.	text out-of-date	(-09%)
6.	more detail included than necessary	(+08%)
7.	text written in a way which is difficult to follow	(+05%)
8.	relationships between important ideas not pointed out	(-05%)
9.	irrelevant information included	(+04%)
10.	not enough examples or clarification of ideas	(-03%)
11.	good chapter summary not included	(-03%)
12.	topics not covered in as much detail as needed	(+01%)
13.	important ideas not pointed out	(-01%)

Table 13E

Texas (Part II) HISTORY

Difference between male & female

1.	insufficient introductory or background information	(-17%)
2.	relationships between important ideas not pointed out	(-15%)
3.	vocabulary difficult to understand	(-13%)
4.	text is out-of-date	(-12%)
5.	good chapter summary not included	(-11%)
6.	not enough examples or clarification of ideas	(+08%)
7.	text written in a way which is difficult to follow	(-08%)
8.	relationships between important ideas not pointed out	(-06%)
9.	irrelevant information included	(+04%)
10.	important ideas not clearly pointed out	(+03%)
11.	topics not covered in as much detail as needed	(+03%)
12.	more detail included than necessary	(+02%)
13.	students expected to know more than they do	(+01%)

Texas

Table 13F

Difference between History males & Biology males

1.	more detail included than necessary	(-46%)
2.	text is written in a way which is difficult to follow	(-24%)
3.	vocabulary difficult to understand	(-22%)
4.	insufficient introductory or background information	(-16%)
5.	relationships between important ideas not pointed out	(-12%)
6.	good chapter summary not included	(-11%)
7.	not enough examples or clarification of ideas	(+07%)
8.	text is out-of-date	(+07%)
9.	irrelevant information included	(-05%)
10.	important ideas not clearly pointed out	(+04%)
11.	students expected to know more than they do	(-02%)
12.	ideas not related to what students may already know	(+01%)
13.	topics not covered in as much detail as needed	(+01%)

Texas

Table 13G

Difference between History females & Biology females

1.	more detail included than necessary	(-40%)
2.	students expected to know more than they do	(-31%)
3.	vocabulary difficult to understand	(-25%)
4.	insufficient introductory and background information	(-12%)
5.	text is written in a way which is difficult to follow	(-11%)
6.	text is out-of-date	(+10%)
7.	important ideas not clearly pointed out	(-09%)
8.	irrelevant information included	(-05%)
9.	not enough examples or clarification of ideas	(-04%)
10.	ideas not related to what students may already know	(-03%)
11.	good chapter summary not included	(-03%)
12.	relationships between important ideas not pointed out	(-02%)
13.	topics not covered in as much detail as needed	(-01%)

Illinois

Table 14A

Male

1.	not enough examples	(79%)
2.	important ideas not clearly pointed out	(77%)
3.	relationships between important ideas not pointed out	(77%)
4.	vocabulary difficult to understand	(76%)
5.	students expected to know more than they do	(76%)
6.	ideas not related to what students may already know	(75%)
7.	more information included than necessary	(75%)
8.	topics not covered in as much detail as needed	(73%)
9.	ideas organized in a way which is difficult to follow	(70%)
10.	insufficient background information.	(70%)
11.	good chapter summary not included	(64%)
12.	text out-of-date	(52%)

Female

1.	vocabulary difficult to understand	(82%)
2.	important ideas not clearly pointed out	(82%)
3.	students expected to know more than they do	(81%)
4.	relationships between important ideas not pointed out	(79%)
5.	ideas not related to what students may already know	(79%)
6.	topics not covered in as much detail as needed	(78%)
7.	more information included than necessary	(75%)
8.	not enough examples	(72%)
9.	good chapter summary not included	(71%)
10.	insufficient background information	(63%)
11.	ideas organized in a way which is difficult to follow	(62%)
12.	text out-of-date	(49%)

Table 14B

Illinois

Difference between Male & Female

1.	ideas organized in a way which is difficult to follow	(+08%)
2.	insufficient background knowledge	(+07%)
3.	not enough example	(+07%)
4.	good chapter summary not included	(-07%)
5.	vocabulary difficult to understand	(-06%)
6.	important ideas not clearly pointed out	(-05%)
7.	students expected to know more than they do	(-05%)
8.	topics not covered in as much detail as needed	(-05%)
9.	ideas not related to what students may already know	(-04%)
10.	text out-of-date	(+03%)
11.	relationships between important ideas not pointed out	(-02%)
12.	more information included than necessary	(00%)

TABLE 14C

Question	Mean		Standard Deviation		1 never a problem		2 sometimes a problem		3 almost always a problem		4 always a problem	
	M	F	M	F	M	F	M	F	M	F	M	F
1. The text uses words which are difficult to understand	1.8970	1.9835	.6404	.6435	.24 (40)	.18 (33)	.64 (105)	.69 (125)	.10 (17)	.10 (18)	.02 (3)	.03 (6)
2. The text does not tell you which ideas in the chapter are important; that is, which ideas you should remember	2.1879	2.2747	.9146	.8866	.23 (38)	.18 (33)	.46 (76)	.47 (86)	.20 (33)	.24 (43)	.11 (18)	.11 (20)
3. The text does not tell you how one important idea is related to another important idea	2.1515	2.1429	.8876	.8287	.23 (38)	.21 (39)	.48 (80)	.49 (90)	.19 (31)	.23 (41)	.10 (16)	.07 (12)
4. The text does not explain how new ideas are related to things you already know	2.1585	2.1703	.9197	.8466	.25 (41)	.21 (38)	.45 (73)	.49 (89)	.20 (33)	.23 (41)	.10 (17)	.07 (14)
5. The text organizes ideas in a way which is difficult to follow	1.9152	1.8462	.7762	.8333	.30 (50)	.38 (69)	.52 (86)	.45 (82)	.14 (22)	.12 (21)	.04 (7)	.05 (10)
6. The text does not include enough background information before it discusses new ideas	1.9146	1.8132	.7786	.7640	.30 (49)	.37 (67)	.54 (88)	.48 (88)	.11 (19)	.12 (21)	.05 (8)	.03 (6)

TABLE 14C (continued)

Question	Mean		Standard Deviation		1 never a problem		2 sometimes a problem		3 almost always a problem		4 always a problem	
	M	F	M	F	M	F	M	F	M	F	M	F
7. The text does not include enough examples to help you understand new ideas	2.0244	2.0055	.7509	.8040	.21 (35)	.28 (51)	.60 (99)	.47 (86)	.13 (21)	.21 (38)	.06 (9)	.04 (7)
8. The text does not include a good summary of the important ideas in the chapter	2.0485	2.0934	1.0170	.9146	.36 (59)	.29 (52)	.37 (61)	.42 (77)	.14 (23)	.20 (37)	.13 (22)	.09 (16)
9. The text expects you to know more about what you are reading than you usually do	2.2000	2.3791	.9383	.9828	.24 (40)	.19 (35)	.43 (71)	.41 (74)	.21 (35)	.23 (42)	.12 (19)	.17 (31)
10. The text does not discuss as many of the ideas as the teacher expects you to know	2.1333	2.2253	.9534	.9454	.27 (45)	.22 (41)	.44 (73)	.46 (83)	.17 (27)	.19 (34)	.12 (20)	.13 (24)
11. The text spends too much time discussing ideas the teacher does not expect you to know	2.1515	1.9725	.9345	.7465	.25 (41)	.25 (46)	.47 (78)	.56 (102)	.16 (26)	.15 (27)	.12 (20)	.04 (7)
12. The text is out-of-date--that is, the text does not discuss current issues	1.7758	1.6703	.9458	.8417	.48 (79)	.51 (92)	.37 (61)	.38 (70)	.05 (8)	.04 (8)	.10 (17)	.07 (12)

Table 14D

Biology (Illinois Part II)

Difference between males & females

1.	more information included than necessary	(+15%)
2.	insufficient background information	(+14%)
3.	students expected to know more than they do	(-12%)
4.	ideas not related to what students may already know	(-09%)
5.	vocabulary difficult to understand	(-07%)
6.	important ideas not clearly pointed out	(-06%)
7.	ideas organized in a way which is difficult to follow	(+05%)
8.	good chapter summary not included	(-04%)
9.	topics not covered in as much detial as needed	(-02%)
10.	text out-of-date	(+02%)
11.	relationships between important ideas not pointed out	(+01%)
12.	not enough examples	(00%)

Table 14E

History (Illinois Part II)

Difference between males & females

1.	not enough examples	(+12%)
2.	ideas organized in a way which is difficult to follow	(+10%)
3.	good chapter summary not included	(-09%)
4.	topics not covered in as much detail as needed	(-07%)
5.	important ideas not clearly pointed out	(-04%)
6.	insufficient background information	(+04%)
7.	text out-of-date	(+04%)
8.	vocabulary difficult to understand	(-03%)
9.	relationships between important ideas not pointed out	(-03%)
10.	ideas not related to what students may already know	(-01%)
11.	students expected to know more than they do	(-01%)
12.	more information included than necessary	(-01%)

Table 14F

Illinois Part II

Difference between History males & Biology males

1.	vocabulary difficult to understand	(-16%)
2.	insufficient background information	(-14%)
3.	more information included than necessary	(-14%)
4.	not enough examples	(+08%)
5.	important ideas not clearly pointed out	(+07%)
6.	ideas not related to what students may already know	(+06%)
7.	a good summary not included	(-06%)
8.	text is out-of-date	(-04%)
9.	relationships between important ideas not pointed out	(+02%)
10.	ideas organized in a way which is difficult to follow	(-02%)
11.	students expected to know more than they do	(00%)
12.	topics not covered in as much detail as needed	(00%)

Table 14G
Illinois Part II
Difference between History female & Biology female

1.	vocabulary difficult to understand	(-20%)
2.	students expected to know more than they do	(-13%)
3.	ideas organized in a way which is difficult to follow	(-07%)
4.	relationships between important ideas not pointed out	(+06%)
5.	text is out-of-date	(-06%)
6.	important ideas not clearly pointed out	(+05%)
7.	topics not covered in as much detail as needed	(+05%)
8.	insufficient background information	(-04%)
9.	not enough examples	(-04%)
10.	ideas not related to what students may already know	(-02%)
11.	more information included than necessary	(-02%)
12.	a good summary not included	(-01%)

Table 15A

Collapsed Frequency of Texas Students Responses to Survey

Part III

1.	remember what was read a week later	(87%)
2.	concentrate while reading	(75%)
3.	know how well information read will be remembered	(71%)
4.	remember what was read a day later	(70%)
5.	identify relationships between ideas	(69%)
6.	generate questions to guide reading	(69%)
7.	construct an outline	(64%)
8.	summarize chapter	(63%)
9.	know how well information read is understood	(63%)
10.	complete textbook questions/activities	(62%)
11.	identify important ideas	(59%)
12.	understand difficult vocabulary	(59%)
13.	prepare for exam or quiz	(59%)
14.	change reading rate to suit purpose	(55%)
15.	notetaking after reading chapter	(54%)
16.	notetaking while reading	(50%)
17.	interpret diagrams, graphs, etc.	(46%)
18.	complete teacher questions/activities	(45%)

TABLE 15B

Question	N	Mean	Standard Deviation	1 A Lot of Difficulty	2 Some Difficulty	3 Occasional Difficulty	4 Rarely Any Difficulty	5 Never Any Difficulty
1. Identifying important ideas in the chapter.	222	3.2252	1.0480	.05 (11)	.20 (44)	.34 (76)	.30 (66)	.11 (25)
2. Identifying relationships between ideas in the chapter.	271	2.9889	1.0309	.08 (22)	.23 (61)	.38 (104)	.24 (66)	.07 (18)
3. Understanding difficult vocabulary.	271	3.0738	1.1809	.11 (29)	.23 (63)	.25 (67)	.30 (83)	.11 (29)
4. Interpreting diagrams, graphs, etc.	272	3.4338	1.1666	.08 (23)	.12 (33)	.26 (68)	.36 (99)	.18 (49)
5. Constructing an outline for the information in the chapter.	265	2.9736	1.1755	.13 (34)	.22 (59)	.29 (77)	.27 (70)	.09 (25)
6. Taking notes while you read the chapter.	262	3.3168	1.2575	.11 (29)	.15 (40)	.24 (63)	.30 (79)	.20 (51)
7. Taking notes after you have read the chapter.	266	3.2744	1.2084	.11 (28)	.14 (38)	.29 (78)	.29 (77)	.17 (45)
8. Summarizing the chapter in your own words.	269	2.9517	1.2374	.14 (39)	.24 (64)	.25 (68)	.25 (67)	.12 (31)
9. Generating questions to guide your reading of the chapter.	266	2.9436	1.0571	.09 (25)	.24 (64)	.36 (95)	.25 (65)	.06 (17)
10. Answering questions or completing activities the text has provided.	270	3.1296	1.1117	.07 (20)	.22 (59)	.33 (89)	.26 (70)	.12 (32)

TABLE 15B (continued)

Question	N	Mean	Standard Deviation	1 A Lot of Difficulty	2 Some Difficulty	3 Occasional Difficulty	4 Rarely Any Difficulty	5 Never Any Difficulty
11. Answering questions or completing activities the teacher has provided.	270	3.4630	1.0259	.05 (13)	.12 (33)	.28 (76)	.41 (112)	.14 (36)
12. Preparing for an exam or quiz.	267	3.1199	1.1473	.12 (31)	.16 (42)	.31 (84)	.31 (84)	.10 (26)
13. Changing your reading rate (skimming, previewing, reading slowly) with your purpose for reading and type of material you are reading.	265	3.2340	1.1830	.09 (25)	.17 (46)	.29 (76)	.30 (78)	.15 (40)
14. Knowing how well you have either understood or misunderstood what you have read.	271	3.1070	1.1641	.09 (25)	.22 (59)	.32 (85)	.24 (66)	.13 (36)
15. Knowing how well you will be able to remember what you have read.	270	2.8778	1.1192	.12 (33)	.25 (67)	.34 (91)	.21 (58)	.08 (21)
16. Remembering what you have read a day later.	270	2.8778	1.1455	.13 (34)	.26 (70)	.31 (84)	.22 (59)	.08 (23)
17. Remembering what you have read a week later.	269	2.1487	1.0367	.32 (85)	.36 (98)	.19 (50)	.12 (33)	.01 (3)
18. Concentrating as you read the chapter.	270	2.6111	1.2408	.24 (64)	.24 (66)	.27 (73)	.17 (45)	.08 (22)

Table 16A

(Illinois)

1.	remember what was read a week later	(82.7%)
2.	concentrate while reading	(74%)
3.	identify relationships between ideas	(63%)
4.	know how well information read will be remembered	(63%)
5.	summarize the chapter	(61%)
6.	prepare for exam or quiz	(61%)
7.	remember what was read a day later	(59%)
8.	know how well information read is understood	(59%)
9.	identify important ideas	(57%)
10.	understand difficult vocabulary	(57%)
11.	construct an outline	(54%)
12.	self-questioning while reading	(51%)
13.	recall something to relate to what is being read	(51%)
14.	complete textbook questions/activities	(49%)
15.	complete teacher questions/activities	(45%)
16.	change reading rate to suit purpose	(41%)
17.	understand diagrams, graphs, etc.	(31%)
18.	notetaking	(31%)

TABLE 16B

Question	Mean	Standard Deviation	1 never difficult	2 hardly ever difficult	3 sometimes difficult	4 very difficult
1. Identify important ideas in the chapter	2.5591	.7322	.08 (27)	.35 (122)	.50 (175)	.07 (23)
2. Identify how important ideas are related	2.7081	.7566	.05 (18)	.32 (110)	.50 (173)	.13 (45)
3. Understand difficult words	2.5418	.9252	.17 (58)	.26 (90)	.44 (152)	.13 (47)
4. Understand diagrams, graphs, etc.	2.0519	.9203	.33 (114)	.36 (125)	.24 (84)	.07 (24)
5. Outline the information in the chapter	2.5202	.8687	.13 (46)	.33 (115)	.42 (144)	.12 (41)
6. Take notes from what you read in the chapter	2.0838	.9669	.33 (114)	.36 (123)	.21 (75)	.10 (34)
7. Summarize the chapter in your own words	2.6561	.9010	.12 (42)	.27 (94)	.44 (151)	.17 (59)
8. Think of questions to ask yourself about what you are reading	2.4928	.9154	.16 (54)	.33 (114)	.37 (130)	.14 (47)
9. Recall something you already know that will relate to what you are reading	2.4813	.9006	.16 (54)	.33 (115)	.39 (135)	.12 (43)

TABLE 16B (continued)

Question	Mean	Standard Deviation	1 never difficult	2 hardly ever difficult	3 sometimes difficult	4 very difficult
10. Answer the questions or complete the activities included in the chapter	2.4323	.8138	.14 (47)	.37 (128)	.42 (147)	.07 (25)
11. Answer the questions or complete the activities the teacher has provided	2.3786	.7526	.12 (41)	.43 (149)	.40 (140)	.05 (16)
12. Change your reading rate (skimming, previewing, reading slowly) with your purpose for reading and type of material you are reading	2.2448	.9104	.21 (73)	.38 (132)	.31 (107)	.10 (34)
13. Prepare for an exam or quiz	2.6686	.9201	.12 (43)	.27 (94)	.42 (145)	.19 (65)
14. Know how well you have either understood or misunderstood what you have read	2.5620	.8284	.12 (42)	.29 (102)	.49 (169)	.10 (34)
15. Know how well you will be able to remember what you have read	2.7262	.8135	.06 (22)	.31 (109)	.46 (158)	.17 (58)
16. Remember what you have read a day later	2.6744	.8367	.08 (27)	.33 (115)	.43 (149)	.16 (56)

TABLE 16B (continued)

Question	Mean	Standard Deviation	1 never difficult	2 hardly ever difficult	3 sometimes difficult	4 very difficult
17. Remember what you have read a week later	3.2478	.7463	.006 (2)	.167 (58)	.401 (139)	.426 (148)
18. Concentrate as you read the chapter	2.9395	.8530	.06 (23)	.20 (68)	.47 (163)	.27 (93)

Texas

TABLE 17A

	BIOLOGY			HISTORY	
1.	remember what was read a week later	(86%)	1.	remember what was read a week later	(88%)
2.	concentrating while reading	(76%)	2.	remember what was read a day later	(74%)
3.	know how well information read will be remembered	(72%)	3.	concentrating while reading	
4.	identify relationships between ideas	(71%)	4.	identify relationships between ideas	(65%)
5.	generate questions to guide reading	(71%)	5.	know how well information will be remembered	(65%)
6.	remember what was read a day later	(68%)	6.	generate questions to guide reading	(64%)
7.	complete textbook questions/activities	(66%)	7.	construct an outline	(61%)
8.	construct an outline	(65%)	8.	summarize the chapter	(60%)
9.	summarize the chapter	(65%)	9.	know how well information read is understood	(56%)
10.	know how well information read is understood	(65%)	10.	notetaking after reading chapter	(53%)
11.	understand difficult vocabulary	(64%)	11.	identify important ideas	(51%)
12.	identify important ideas	(62%)	12.	complete textbook questions/activities	(51%)
13.	prepare for exam or quiz	(62%)	13.	prepare for exam or quiz	(50%)
14.	change reading rate to suit purposes	(57%)	14.	change reading rate to suit purposes	(50%)
15.	notetaking after reading chapter	(55%)	15.	understand difficult vocabulary	(44%)
16.	notetaking while reading	(54%)	16.	complete teacher questions/activities	(44%)
17.	interpret diagrams, graphs, etc.	(47%)	17.	interpret diagrams, graphs, etc.	(41%)
18.	complete teacher questions/activities	(46%)	18.	notetaking while reading chapter	(40%)

TEXAS

TABLE 17B

Difference between Biology & History

1.	understand difficult vocabulary	(-20%)
2.	complete textbook questions/activities	(-15%)
3.	notetaking while reading chapter	(-14%)
4.	preparing for exam or quiz	(-12%)
5.	identify important ideas	(-11%)
6.	know how well information read is understood	(-09%)
7.	generate questions to guide reading	(-07%)
8.	change reading rate to suit purpose	(-07%)
9.	know how well information read will be remembered	(-07%)
10.	identify relationships between ideas	(-06%)
11.	interpret diagrams, graphs, etc.	(-06%)
12.	remember what was read a day later	(+06%)
13.	summarize the chapter	(-05%)
14.	construct an outline	(-04%)
15.	concentrate while reading	(-04%)
16.	notetaking after reading chapter	(-02%)
17.	complete teacher questions/activities	(-02%)
18.	remember what was read a week later	(+02%)

TABLE 17C

Questions	n		Mean		Standard Deviation		1 A Lot of Difficulty		2 Some Difficulty		3 Occasional Difficulty		4 Rarely Any Difficulty		5 Never Any Difficulty	
	B	H	B	H	B	H	B	H	B	H	B	H	B	H	B	H
1. Identifying important ideas in the chapter.	167	55	3.1377	3.4909	1.0466	1.0160	.06 (10)	.02 (1)	.22 (36)	.15 (8)	.34 (57)	.34 (19)	.29 (49)	.31 (17)	.09 (15)	.18 (10)
2. Identifying relationships between ideas in the chapter.	202	69	2.9554	3.0870	1.0138	1.0811	.09 (17)	.07 (5)	.23 (46)	.22 (15)	.39 (79)	.36 (25)	.24 (49)	.25 (17)	.05 (11)	.10 (7)
3. Understanding difficult vocabulary.	203	68	2.9606	3.4118	1.1892	1.0959	.12 (25)	.06 (4)	.26 (52)	.16 (11)	.26 (52)	.22 (15)	.27 (54)	.43 (29)	.10 (20)	.13 (9)
4. Interpreting diagrams, graphs, etc.	203	69	3.3990	3.5362	1.1661	1.1705	.08 (17)	.09 (6)	.13 (27)	.09 (6)	.26 (52)	.23 (16)	.36 (72)	.39 (27)	.17 (35)	.20 (14)
5. Constructing an outline for the information in the chapter.	198	67	2.9545	3.0299	1.1368	1.2906	.11 (22)	.18 (12)	.25 (50)	.13 (9)	.29 (57)	.30 (20)	.27 (53)	.26 (17)	.08 (16)	.13 (9)
6. Taking notes while you read the chapter.	194	68	3.2526	3.5000	1.2522	1.2637	.12 (23)	.09 (6)	.15 (29)	.16 (11)	.27 (53)	.15 (10)	.28 (54)	.37 (25)	.18 (35)	.23 (16)
7. Taking notes after you have read the chapter.	198	68	3.2475	3.3529	1.1769	1.3017	.10 (19)	.13 (9)	.16 (32)	.09 (6)	.29 (57)	.31 (21)	.31 (61)	.235 (16)	.14 (29)	.235 (16)
8. Summarizing the chapter in your own words.	202	67	2.9208	3.0448	1.2191	1.2961	.14 (29)	.15 (10)	.25 (50)	.21 (14)	.26 (52)	.24 (16)	.25 (50)	.25 (17)	.10 (21)	.15 (10)
9. Generating questions to guide your reading of the chapter.	198	68	2.8939	3.0882	1.0344	1.1162	.10 (19)	.09 (6)	.25 (50)	.21 (14)	.36 (72)	.34 (23)	.24 (47)	.26 (18)	.05 (10)	.10 (7)
10. Answering questions or completing activities the text has provided.	203	67	3.0443	3.3881	1.0777	1.1801	.07 (15)	.08 (5)	.24 (49)	.15 (10)	.35 (70)	.28 (19)	.25 (50)	.30 (20)	.09 (19)	.19 (13)

TABLE 17C (continued)

Questions	n		Mean		Standard Deviation		1 A Lot of Difficulty		2 Some Difficulty		3 Occasional Difficulty		4 Rarely Any Difficulty		5 Never Any Difficulty	
	B	H	B	H	B	H	B	H	B	H	B	H	B	H	B	H
11. Answering questions or completing activities the teacher has provided.	202	68	3.4257	3.5735	1.0400	.9822	.05 (10)	.04 (3)	.15 (29)	.06 (4)	.26 (53)	.34 (23)	.42 (85)	.40 (27)	.12 (25)	.16 (11)
12. Preparing for an exam or quiz.	199	68	3.0503	3.3235	1.1448	1.1387	.13 (25)	.09 (6)	.16 (33)	.13 (9)	.33 (65)	.28 (19)	.30 (59)	.37 (25)	.08 (17)	.13 (9)
13. Changing your reading rate (skimming, previewing, reading slowly) with your purpose for reading and type of material you are reading.	199	66	3.1960	3.3485	1.2172	1.0741	.11 (21)	.06 (4)	.18 (36)	.15 (10)	.28 (57)	.29 (19)	.27 (53)	.38 (25)	.16 (32)	.12 (8)
14. Knowing how well you have either understood or misunderstood what you have read.	202	69	3.0545	3.2609	1.1811	1.1068	.10 (20)	.07 (5)	.24 (48)	.16 (11)	.31 (62)	.33 (23)	.22 (45)	.31 (21)	.13 (27)	.13 (9)
15. Knowing how well you will be able to remember what you have read.	201	69	2.8507	2.9565	1.0989	1.1812	.11 (23)	.14 (10)	.27 (54)	.19 (13)	.34 (69)	.32 (22)	.20 (40)	.26 (18)	.08 (15)	.09 (6)
16. Remembering what you have read a day later.	201	69	2.8806	2.8696	1.1940	.9987	.14 (28)	.09 (6)	.26 (52)	.26 (18)	.28 (57)	.39 (27)	.22 (44)	.22 (15)	.10 (20)	.04 (3)
17. Remembering what you have read a week later.	201	68	2.1294	2.2059	1.0598	.9706	.33 (67)	.27 (18)	.36 (72)	.38 (26)	.17 (34)	.23 (16)	.12 (25)	.12 (8)	.02 (3)	.00 (0)
18. Concentrating as you read the chapter.	201	69	2.5672	2.7391	1.2437	1.2326	.25 (50)	.20 (14)	.25 (51)	.22 (15)	.26 (52)	.30 (21)	.16 (32)	.19 (13)	.08 (16)	.09 (6)

Illinois

TABLE 18A

	BIOLOGY			HISTORY	
1.	remember what was read a week later	(85%)	1.	remember what was read a day later	(81%)
2.	prepare for exam or quiz	(73%)	2.	concentrate while reading	(73%)
3.	concentrate while reading	(73%)	3.	know how well information read will be remembered	(62%)
4.	understand difficult vocabulary	(67%)	4.	identify relationships between ideas	(61%)
5.	identify relationships between ideas	(66%)	5.	know how well information read is understood	(59%)
6.	know how well information read will be remembered	(63%)	6.	remember what was read a day later	(59%)
7.	summarize the chapter	(63%)	7.	summarize the chapter	(59%)
8.	remember what was read a day later	(59%)	8.	identify important ideas	(58%)
9.	complete textbook questions/activities	(58%)	9.	prepare for exam or quiz	(52%)
10.	know how well information read is understood	(58%)	10.	construct an outline	(51%)
11.	identify important ideas	(56%)	11.	self-questioning while reading	(51%)
12.	construct an outline	(56%)	12.	understand difficult vocabulary	(50%)
13.	recall something to relate to what is being read	(55%)	13.	recall something to relate to what is being read	(49%)
14.	self-questioning while reading	(52%)	14.	complete textbook questions/activities	(44%)
15.	complete teacher questions/activities	(50%)	15.	complete teacher questions/activities	(42%)
16.	change reading rate to suit purposes	(48%)	16.	change reading rate to suit purposes	(36%)
17.	understand diagrams, graphs, etc.	(35%)	17.	notetaking	(31%)
18.	notetaking	(32%)	18.	understand diagrams, graphs, etc.	(28%)

Illinois

TABLE 18B

Difference between Biology & +History

1.	prepare for exam or quiz	(-21%)
2.	understand difficult vocabulary	(-17%)
3.	complete textbook questions/activities	(-14%)
4.	change reading rate to suit purposes	(-12%)
5.	complete teacher questions/activities	(-08%)
6.	understand diagrams, graphs, etc.	(-07%)
7.	recall something to relate to what is being read	(-06%)
8.	identify important ideas	(-05%)
9.	construct an outline	(-05%)
10.	summarize the chapter	(-04%)
11.	remember what was read a week later	(-04%)
12.	identify important ideas	(+02%)
13.	notetaking	(-01%)
14.	self-questioning while reading	(-01%)
15.	know how well information read is understood	(+01%)
16.	know how well information will be remembered	(-01%)
17.	concentrate while reading	(+01%)
18.	remember what was read a day later	(00%)

TABLE 18C

Question	Mean		Standard Deviation		1 never difficult		2 hardly ever difficult		3 sometimes difficult		4 very difficult	
	B	H	B	H	B	H	B	H	B	H	B	H
1. Identify important ideas in the chapter	2.5524	2.5637	.6573	.7821	.05 (7)	.10 (20)	.39 (56)	.32 (66)	.52 (74)	.50 (101)	.04 (6)	.08 (17)
2. Identify how important ideas are related	2.7622	2.6700	.7312	.7736	.03 (5)	.06 (13)	.31 (44)	.33 (66)	.52 (74)	.49 (99)	.14 (20)	.12 (25)
3. Understand difficult words	2.7483	2.3971	.8431	.9542	.09 (13)	.22 (45)	.24 (34)	.28 (56)	.50 (72)	.39 (80)	.17 (24)	.11 (23)
4. Understand diagrams, graphs, etc.	2.2028	1.9461	.9004	.9216	.24 (34)	.39 (80)	.41 (58)	.33 (67)	.27 (39)	.22 (45)	.08 (12)	.06 (12)
5. Outline the information in the chapter	2.5352	2.5098	.9044	.8451	.16 (22)	.12 (24)	.28 (40)	.37 (75)	.43 (62)	.40 (82)	.13 (18)	.11 (23)
6. Take notes from what you read in the chapter	2.1197	2.0588	.9262	.9958	.29 (41)	.36 (73)	.39 (55)	.33 (68)	.24 (34)	.20 (41)	.08 (12)	.11 (22)
7. Summarize the chapter in your own words	2.7113	2.6176	.9193	.8883	.12 (17)	.12 (25)	.25 (35)	.29 (59)	.43 (62)	.44 (89)	.20 (28)	.15 (31)
8. Think of questions to ask yourself about what you are reading	2.5423	2.4581	.9119	.9184	.13 (19)	.17 (35)	.35 (49)	.32 (65)	.37 (52)	.39 (78)	.15 (22)	.12 (25)
9. Recall something you already know that will relate to what you are reading	2.5315	2.4461	.9178	.8889	.15 (22)	.16 (32)	.30 (43)	.35 (72)	.41 (58)	.38 (77)	.14 (20)	.11 (23)

TABLE 18C (continued)

Question	Mean		Standard Deviation		1 never difficult		2 hardly ever difficult		3 sometimes difficult		4 very difficult	
	B	H	B	H	B	H	B	H	B	H	B	H
10. Answer the questions or complete the activities included in the chapter	2.6014	2.3137	.7135	.8594	.06 (8)	.19 (39)	.36 (52)	.37 (76)	.50 (72)	.37 (75)	.08 (11)	.07 (14)
11. Answer the questions or complete the activities the teacher has provided	2.4859	2.3039	.7019	.7789	.06 (9)	.16 (32)	.44 (63)	.42 (86)	.44 (62)	.38 (78)	.06 (8)	.04 (8)
12. Change your reading rate (skimming, previewing, reading slowly) with your purpose for reading and type of material you are reading	2.3846	2.2315	.8875	.9231	.18 (26)	.23 (47)	.34 (49)	.41 (83)	.39 (55)	.26 (52)	.09 (13)	.10 (21)
13. Prepare for an exam or quiz	2.8322	2.5539	.8306	.9634	.08 (12)	.15 (31)	.19 (27)	.33 (67)	.54 (77)	.33 (68)	.19 (27)	.19 (38)
14. Know how well you have either understood or misunderstood what you have read	2.5664	2.5588	.7922	.8547	.11 (15)	.13 (27)	.31 (44)	.28 (58)	.50 (72)	.48 (97)	.08 (12)	.11 (22)
15. Know how well you will be able to remember what you have read	2.6923	2.7500	.7620	.8488	.05 (8)	.07 (14)	.32 (46)	.31 (63)	.50 (71)	.43 (87)	.13 (18)	.19 (40)
16. Remember what you have read a day later	2.6643	2.6814	.7956	.8661	.06 (9)	.09 (18)	.35 (50)	.32 (65)	.45 (64)	.42 (85)	.14 (20)	.17 (36)

TABLE 18C (continued)

Question	Mean		Standard Deviation		1 never difficult		2 hardly ever difficult		3 sometimes difficult		4 very difficult	
	B	H	B	H	B	H	B	H	B	H	B	H
17. Remember what you have read a week later	3.2448	3.2500	.7043	.7760	.00 (0)	.01 (2)	.15 (22)	.18 (36)	.45 (64)	.37 (75)	.40 (57)	.44 (91)
18. Concentrate as you read the chapter	2.9021	2.9657	.8334	.8675	.06 (9)	.07 (14)	.21 (30)	.19 (38)	.49 (70)	.45 (93)	.24 (34)	.29 (59)

Texas

TABLE 19A

	MALE			FEMALE	
1.	remember what was read a week later	(82.2%)	1.	remember what was read a week later	(91%)
2.	concentrate while reading	(68%)	2.	concentrate while reading	(82%)
3.	generate questions to guide reading	(66%)	3.	remember what was read a day later	(80%)
4.	complete textbook questions/activities	(66%)	4.	know how well information read will be remembered	(76%)
5.	know how well information read will be remembered	(65%)	5.	identify relationships between ideas	(73%)
6.	identify relationships between ideas	(64%)	6.	generate questions to guide reading	(72%)
7.	construct an outline	(62%)	7.	know how well information read is understood	(68%)
8.	summarize the chapter	(60%)	8.	construct an outline	(67%)
9.	prepare for exam or quiz	(59%)	9.	summarize the chapter	(67%)
10.	remember what was read a day later	(57%)	10.	identify important ideas	(63%)
11.	know how well information read is understood	(56%)	11.	prepare for exam or quiz	(59%)
12.	identify important ideas	(55%)	12.	notetaking after reading chapter	(58%)
13.	change reading rate to suit purpose	(55%)	13.	complete textbook questions/activities	(58%)
14.	understand difficult vocabulary	(53%)	14.	change reading rate to suit purpose	(57%)
15.	notetaking while reading	(53%)	15.	understand difficult vocabulary	(53%)
16.	notetaking after reading chapter	(50%)	16.	interpret diagrams, graphs, etc.	(53%)
17.	complete teacher questions/activities	(47%)	17.	notetaking while reading	(47%)
18.	interpret diagrams, graphs, etc.	(37%)	18.	complete teacher questions/activities	(43%)

Texas

TABLE 19B

Difference between +male & female

1.	remember what was read a day later	(-23%)
2.	interpret diagrams, graphs, etc.	(-16%)
3.	concentrate while reading	(-14%)
4.	know how well information read is understood	(-12%)
5.	know how well information read will be remembered	(-11%)
6.	identify relationships between ideas	(-09%)
7.	identify important ideas	(-08%)
8.	notetaking after reading chapter	(-08%)
9.	complete textbook questions/activities	(+08%)
10.	remember what was read a week later	(-08.8%)
11.	summarize the chapter	(-07%)
12.	notetaking while reading	(+06%)
13.	generate questions to guide reading	(-06%)
14.	construct an outline	(-05%)
15.	complete teacher questions/answers	(+04%)
16.	change reading rate to suit purpose	(-02%)
17.	understood difficult vocabulary	(00%)
18.	preparing for exam or quiz	(00%)

TABLE 19C

Questions	n		Mean		Standard Deviation		1 A Lot of Difficulty		2 Some Difficulty		3 Occasional Difficulty		4 Rarely Any Difficulty		5 Never Any Difficulty	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1. Identifying important ideas in the chapter.	110	112	3.3636	3.0893	1.0381	1.0445	.04 (4)	.06 (7)	.16 (18)	.23 (26)	.35 (38)	.34 (38)	.31 (34)	.29 (32)	.14 (16)	.08 (9)
2. Identifying relationships between ideas in the chapter.	127	144	3.1181	2.8750	1.0512	1.0026	.08 (10)	.08 (12)	.70 (22)	.27 (39)	.39 (49)	.38 (55)	.28 (35)	.22 (31)	.08 (11)	.05 (7)
3. Understanding difficult vocabulary.	128	143	3.2500	2.9161	1.1570	1.1838	.08 (10)	.08 (19)	.21 (26)	.18 (37)	.24 (31)	.27 (36)	.34 (44)	.33 (39)	.13 (17)	.14 (12)
4. Interpreting diagrams, graphs, etc.	129	143	3.6124	3.2727	1.0991	1.2055	.06 (8)	.10 (15)	.09 (12)	.15 (21)	.22 (28)	.28 (40)	.43 (55)	.31 (44)	.20 (26)	.16 (23)
5. Constructing an outline for the information in the chapter.	126	139	3.0556	2.8993	1.1887	1.1628	.10 (12)	.16 (22)	.26 (33)	.19 (26)	.26 (33)	.32 (44)	.25 (32)	.27 (38)	.13 (16)	.06 (9)
6. Taking notes while you read the chapter.	123	139	3.1545	3.4604	1.3431	1.1626	.16 (20)	.06 (9)	.16 (20)	.14 (20)	.21 (26)	.27 (37)	.28 (35)	.32 (44)	.19 (22)	.21 (29)
7. Taking notes after you have read the chapter.	126	140	3.2937	3.2571	1.2203	1.2017	.11 (14)	.10 (14)	.14 (18)	.14 (20)	.25 (31)	.34 (47)	.34 (43)	.24 (34)	.16 (20)	.18 (25)
8. Summarizing the chapter in your own words.	127	142	3.0866	2.8310	1.2537	1.2144	.13 (16)	.16 (23)	.21 (27)	.26 (37)	.26 (33)	.25 (35)	.25 (32)	.25 (35)	.15 (19)	.08 (12)
9. Generating questions to guide your reading of the chapter.	127	139	3.0236	2.8705	1.1371	.9768	.11 (14)	.08 (11)	.20 (25)	.28 (39)	.35 (45)	.36 (50)	.24 (30)	.25 (35)	.10 (13)	.03 (4)
10. Answering questions or completing activities the text has provided.	129	141	3.1473	3.1135	1.0391	1.1777	.05 (6)	.10 (14)	.21 (28)	.22 (31)	.40 (51)	.26 (38)	.22 (29)	.30 (41)	.12 (15)	.12 (17)

TABLE 19C (continued)

Questions	n		Mean		Standard Deviation		1 A Lot of Difficulty		2 Some Difficulty		3 Occasional Difficulty		4 Rarely Any Difficulty		5 Never Any Difficulty	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
11. Answering questions or completing activities the teacher has provided.	128	142	3.4531	3.4718	1.0638	.9943	.05 (7)	.04 (6)	.11 (15)	.13 (18)	.31 (39)	.26 (37)	.37 (47)	.46 (65)	.16 (20)	.11 (16)
12. Preparing for an exam or quiz.	124	143	3.1613	3.0839	1.1290	1.1658	.10 (13)	.13 (18)	.15 (18)	.17 (24)	.34 (42)	.29 (42)	.31 (38)	.32 (46)	.10 (13)	.09 (13)
13. Changing your reading rate (skimming, previewing, reading slowly) with your purpose for reading and type of material you are reading.	127	138	3.2520	3.2174	1.2534	1.1188	.12 (15)	.07 (10)	.15 (19)	.20 (27)	.28 (35)	.30 (41)	.27 (35)	.31 (43)	.18 (23)	.12 (17)
14. Knowing how well you have either understood or misunderstood what you have read.	128	143	3.2500	2.9790	1.1570	1.1596	.08 (10)	.10 (15)	.19 (24)	.24 (35)	.29 (37)	.34 (48)	.29 (38)	.20 (28)	.15 (19)	.12 (17)
15. Knowing how well you will be able to remember what you have read.	128	142	3.0625	2.7113	1.1065	1.1082	.09 (11)	.16 (22)	.22 (28)	.27 (39)	.34 (44)	.33 (47)	.25 (32)	.18 (26)	.10 (13)	.06 (8)
16. Remembering what you have read a day later.	127	143	3.2205	2.5734	1.0832	1.1164	.05 (7)	.19 (27)	.21 (27)	.30 (43)	.31 (39)	.31 (45)	.31 (39)	.14 (20)	.12 (15)	.06 (8)
17. Remembering what you have read a week later.	126	143	2.4365	1.8951	1.0237	.9838	.20 (25)	.42 (60)	.36 (45)	.37 (53)	.262 (33)	.12 (17)	.17 (22)	.08 (11)	.008 (1)	.01 (2)
18. Concentrating as you read the chapter.	128	142	2.9297	2.3239	1.2179	1.1942	.15 (19)	.32 (45)	.21 (27)	.27 (39)	.32 (41)	.23 (32)	.20 (26)	.13 (19)	.12 (15)	.05 (7)

Texas--Part III

TABLE 19D

Biology

Difference between +male & female

1.	remember what was read a day later	(-26%)
2.	identify important ideas	(-21%)
3.	concentrate while reading	(-19%)
4.	interpret diagrams, graphs, etc.	(-18%)
5.	understand difficult vocabulary	(-16%)
6.	know how well information read is understood	(-16%)
7.	identify relationships between ideas	(-14%)
8.	know how well information read will be remembered	(-14%)
9.	generate questions to guide reading	(-12%)
10.	remember what was read a week later	(-10%)
11.	summarize the chapter	(-09%)
12.	complete textbook questions/activities	(+08%)
13.	change reading rate to suit purpose	(-04%)
14.	complete teacher questions/activities	(+03%)
15.	prepare for exam or quiz	(-03%)
16.	take notes while reading	(+01%)
17.	take notes after reading chapter	(-01%)
18.	construct an outline	(00%)

TABLE 19E

History

Difference between +male & female

1.	identify important ideas	(-28%)
2.	take notes while reading	(+19%)
3.	construct an outline	(-17%)
4.	interpret diagrams, graphs, etc.	(-13%)
5.	generate questions to guide reading	(+12%)
6.	remember what was read a day later	(-12%)
7.	complete teacher questions/activities	(+11%)
8.	prepare for exam or quiz	(+09%)
9.	know how well information read is understood	(-06%)
10.	understand difficult vocabulary	(-05%)
11.	complete textbook questions/activities	(+04%)
12.	remember what was read a week later	(-04%)
13.	identify relationships between ideas	(+03%)
14.	know how well information read will be remembered	(-03%)
15.	take notes after reading chapter	(+02%)
16.	summarize the chapter	(-02%)
17.	concentrate while reading	(+01%)
18.	change reading rate to suit purpose	(00%)

Texas--Part III TABLE 19F

Difference between +History males and Biology males

1.	complete textbook questions/activities	(-17%)
2.	identify important ideas	(+15%)
3.	understand difficult vocabulary	(-14%)
4.	construct an outline	(-14%)
5.	remember what was read a day later	(+12%)
6.	concentrate while reading	(+07%)
7.	interpret diagrams, graphs, etc.	(-05%)
8.	take notes while reading	(-05%)
9.	generate questions to guide reading	(+05%)
10.	prepare for exam or quiz	(-05%)
11.	change reading rate to suit purpose	(-05%)
12.	remember what was read a week later	(+05%)
13.	identify relationships between ideas	(+04%)
14.	take notes after reading the chapter	(+04%)
15.	complete teacher question/activities	(+03%)
16.	know how well information read is understood	(-03%)
17.	know how well information read will be remembered	(-02%)
18.	summarize the chapter	(-01%)

Texas--Part III TABLE 19G

Difference between +History females & Biology females

1.	identify important ideas	(-34%)
2.	understood difficult vocabulary	(-25%)
3.	take notes while reading	(-23%)
4.	generate questions to guide reading	(-19%)
5.	prepare for exam or quiz	(-17%)
6.	identify relationships between ideas	(-13%)
7.	complete textbook questions/activities	(-13%)
8.	know how well information read is understood	(-13%)
9.	know how well information read will be remembered	(-13%)
10.	concentrate while reading	(-13%)
11.	interpret diagrams, graphs, etc.	(-10%)
12.	change reading rate to suit purpose	(-09%)
13.	take notes after reading chapter	(-08%)
14.	summarize chapter	(-08%)
15.	complete teacher questions/activities	(-05%)
16.	construct an outline	(+03%)
17.	remember what was read a day later	(-02%)
18.	remember what was read a week later	(-01%)

Illinois

TABLE 20A

MALE			FEMALE		
1.	remember what was read a week later	(83.6%)	1.	remember what was read a week later	(81.8%)
2.	concentrate while reading	(69%)	2.	concentrate while reading	(77%)
3.	prepare for exam or quiz	(63%)	3.	identify important ideas	(68%)
4.	remember what was read a day later	(62%)	4.	know how well information read will be remembered	(63%)
5.	summarize the chapter	(61%)	5.	summarize the chapter	(61%)
6.	know how well information read will be remembered	(60%)	6.	know how well information read is understood	(60%)
7.	identify relationships between ideas	(58%)	7.	understand difficult vocabulary	(59%)
8.	identify important ideas	(57%)	8.	recall something to relate to what is being read	(58%)
9.	understand difficult vocabulary	(56%)	9.	prepare for exam or quiz	(58%)
10.	know how well information read is understood	(56%)	10.	identify important ideas	(56%)
11.	self-questioning while reading	(55%)	11.	remember what was read a day later	(56%)
12.	complete textbook questions/activities	(54%)	12.	construct an outline	(55%)
13.	construct outline	(52%)	13.	self-questioning while reading	(48%)
14.	complete teacher questions/activities	(48%)	14.	complete textbook questions/activities	(46%)
15.	recall something to relate to what is being read	(43%)	15.	complete teacher questions/activities	(43%)
16.	change reading rate to suit purposes	(42%)	16.	change reading rate to suit purpose	(39%)
17.	notetaking	(37%)	17.	understand diagrams, graphs, etc.	(33%)
18.	understand diagrams, graphs, etc.	(29%)	18.	notetaking	(27%)

Illinois

TABLE 20B

Difference between +male & female

1.	recall something to relate to what is being read	(-15%)
2.	identify relationships between ideas	(-10%)
3.	notetaking	(+10%)
4.	concentrate while reading	(-08%)
5.	complete textbook questions/activities	(+08%)
6.	self-questioning while reading	(+07%)
7.	remember what was read a day later	(+06%)
8.	complete teacher questions/activities	(+05%)
9.	prepare for exam or quiz	(+05%)
10.	understand diagrams, graphs, etc.	(-04%)
11.	know how well information read is understood	(-04%)
12.	understand difficult vocabulary	(-03%)
13.	construct an outline	(-03%)
14.	change reading rate to suit purpose	(+03%)
15.	know how well information read will be remembered	(-03%)
16.	remember what was read a week later	(+01.8%)
17.	identify important ideas	(+01%)
18.	summarize the chapter	(00%)

TABLE 20C

Question	Mean		Standard Deviation		1 never difficult		2 hardly ever difficult		3 sometimes difficult		4 very difficult	
	M	F	M	F	M	F	M	F	M	F	M	F
1. Identify important ideas in the chapter	2.5576	2.5604	.7271	.7390	.08 (13)	.08 (14)	.35 (57)	.36 (65)	.51 (85)	.49 (90)	.06 (10)	.07 (13)
2. Identify how important ideas are related	2.6402	2.7692	.8056	.7064	.07 (12)	.03 (6)	.35 (57)	.29 (53)	.45 (73)	.55 (100)	.13 (22)	.13 (23)
3. Understand difficult words	2.4667	2.6099	.9724	.8773	.22 (36)	.12 (22)	.22 (37)	.29 (53)	.43 (71)	.45 (81)	.13 (21)	.14 (26)
4. Understand diagrams, graphs, etc.	2.0000	2.0989	.9370	.9049	.36 (60)	.30 (54)	.35 (57)	.37 (68)	.22 (36)	.26 (48)	.07 (12)	.07 (12)
5. Outline the information in the chapter	2.5212	2.5193	.8596	.8793	.12 (20)	.14 (26)	.36 (59)	.31 (56)	.40 (66)	.43 (78)	.12 (20)	.12 (21)
6. Take notes from what you read in the chapter	2.2303	1.9503	.9730	.9444	.26 (43)	.39 (71)	.37 (61)	.34 (62)	.25 (41)	.19 (34)	.12 (20)	.08 (14)
7. Summarize the chapter in your own words	2.6242	2.6851	.9130	.8915	.14 (23)	.10 (19)	.25 (42)	.29 (52)	.45 (74)	.43 (77)	.16 (26)	.18 (33)
8. Think of questions to ask yourself about what you are reading	2.5671	2.4254	.8801	.9435	.12 (20)	.19 (34)	.33 (54)	.33 (60)	.41 (67)	.35 (63)	.14 (23)	.13 (24)
9. Recall something you already know that will relate to what you are reading	2.3636	2.5879	.8909	.8984	.18 (29)	.14 (25)	.39 (64)	.28 (51)	.33 (55)	.44 (80)	.10 (17)	.14 (26)

TABLE 20C (continued)

Question	Mean		Standard Deviation		1 never difficult		2 hardly ever difficult		3 sometimes difficult		4 very difficult	
	M	F	M	F	M	F	M	F	M	F	M	F
17. Remember what you have read a week later	3.2667	3.2308	.7419	.7518	.006 (1)	.006 (1)	.158 (26)	.176 (32)	.400 (66)	.401 (73)	.436 (72)	.417 (76)
18. Concentrate as you read the chapter	2.8909	2.9835	.8973	.8107	.08 (13)	.06 (10)	.23 (37)	.17 (31)	.42 (70)	.51 (93)	.27 (45)	.26 (48)

Illinois--Part III TABLE 20D

Biology

Difference between males & females

1.	identify relationships between ideas	(-12%)
2.	concentrate while reading	(-10%)
3.	notetaking	(+09%)
4.	recall something to relate to what is being read	(-08%)
5.	understand difficult vocabulary	(-07%)
6.	complete teacher questions/activities	(+07%)
7.	complete textbook questions/activities	(+06%)
8.	know how well information read is understood	(+04%)
9.	understand digrams, graphs, etc.	(-03%)
10.	construct an outline	(+03%)
11.	prepare for exam or quiz	(+03%)
12.	identify important ideas	(-02%)
13.	summarize the chapter	(+02%)
14.	self-questioning while reading	(+02%)
15.	change reading rate to suit purpose	(+02%)
16.	know how well information read will be remembered	(-02%)
17.	remember what was read a day later	(-01%)
18.	remember what was read a week later	(-01%)

Illinois--Part III TABLE 20E

History

Difference between +males & females

1.	recall something to relate to what is being read	(-19%)
2.	notetaking	(+12%)
3.	complete textbook questions/activities	(-12%)
4.	self-questioning while reading	(+10%)
5.	know how well information read is understood	(-09%)
6.	identify relationships between ideas	(-08%)
7.	prepare for exam or quiz	(+08%)
8.	remember what was read a day later	(+07%)
9.	concentrate while reading	(-07%)
10.	change reading rate to suit purpose	(+06%)
11.	construct an outline	(-05%)
12.	remember what was read a week later	(+05%)
13.	identify important ideas	(+04%)
14.	understand diagrams, graphs, etc.	(-04%)
15.	know how well information read will be remembered	(+04%)
16.	understand difficult vocabulary	(+03%)
17.	complete teacher questions/activities	(+03%)
18.	summarize the chapter	(-01%)

Illinois--Part III TABLE 20F

Difference between +History males & Biology males

1.	prepare for exam or quiz	(-18%)
2.	understand difficult vocabulary	(-11%)
3.	complete textbook questions/activities	(-11%)
4.	recall something to relate to what is being read	(-10%)
5.	change reading rate to suit purpose	(-10%)
6.	construct an outline	(-09%)
7.	complete teacher questions/activities	(-09%)
8.	understand diagrams, graphs, etc.	(-08%)
9.	know how well information read is understood	(-07%)
10.	summarize the chapter	(-06%)
11.	identify important ideas	(+05%)
12.	remember what was read a day later	(+04%)
13.	concentrate while reading	(+04%)
14.	self-questioning while reading	(+03%)
15.	identify relationships between ideas	(-02%)
16.	know how well information read will be remembered	(-01%)
17.	notetaking	(00%)
18.	remember what was read a week later	(00%)

Illinois--Part III TABLE 20G

Difference between +History females & Biology females

1.	prepare for exam or quiz	(-23%)
2.	understand difficult vocabulary	(-21%)
3.	complete textbook questions/activities	(-17%)
4.	change reading rate to suit purpose	(-14%)
5.	understand diagrams, graphs, etc.	(-07%)
6.	identify relationships between ideas	(-06%)
7.	know how well information read is understood	(+06%)
8.	remember what was read a week later	(-06%)
9.	self-questioning while reading	(-05%)
10.	complete teacher questions/activities	(-05%)
11.	notetaking	(-04%)
12.	summarize the chapter	(-03%)
13.	remember what was read a day later	(-02%)
14.	identify important ideas	(-01%)
15.	construct an outline	(-01%)
16.	recall something to relate to what is being read	(+01%)
17.	know how well information read will be remembered	(+01%)
18.	concentrate while reading	(+01%)

Illinois

TABLE 21A

1.	identify which ideas should be remembered	(97.4%)
2.	review chapter before exam	(96.2%)
3.	relate new ideas to ideas students already know	(93%)
4.	teach students to identify important ideas	(92%)
5.	teach students to identify relationships between ideas	(90%)
6.	provide questions to guide student's reading	(88%)
7.	explain difficult vocabulary	(86%)
8.	use textbook which is more interesting to read	(82%)
9.	provide students with time in class to read	(81%)
10.	discuss information not covered in chapter	(81%)
11.	provide an outline or overview of chapter	(81%)
12.	provide students with time in class to get together and discuss ideas	(76%)
13.	use a textbook which is more up-to-date	(71%)
14.	spend more time explaining the chapter before students read it	(69%)
15.	assign additional activities which will help students understand new ideas	(66%)
16.	provide additional material to read	(54%)
17.	use textbook which is easier to read	(49%)
18.	spend time teaching study skills	(47%)
19.	allow students to read textbook on their own rather than making reading assignments	(40%)
20.	spend time teaching reading skills	(39%)
21.	cease using the textbook	(16%)

TABLE 20C (continued)

Question	Mean		Standard Deviation		1 never difficult		2 hardly ever difficult		3 sometimes difficult		4 very difficult	
	M	F	M	F	M	F	M	F	M	F	M	F
10. Answer the questions or complete the activities included in the chapter	2.4788	2.3901	.8307	.7981	.14 (23)	.13 (24)	.32 (53)	.41 (75)	.46 (76)	.39 (71)	.08 (13)	.07 (12)
11. Answer the questions or complete the activities the teacher has provided	2.4242	2.3370	.7821	.7243	.11 (19)	.12 (22)	.41 (68)	.45 (81)	.41 (67)	.40 (73)	.07 (11)	.03 (5)
12. Change your reading rate (skimming, previewing, reading slowly) with your purpose for reading and type of material you are reading	2.3333	2.2597	.9585	.8654	.22 (36)	.21 (37)	.36 (59)	.40 (73)	.29 (49)	.32 (58)	.13 (21)	.07 (13)
13. Prepare for an exam or quiz	2.7394	2.6044	.9621	.8780	.13 (21)	.12 (22)	.24 (40)	.30 (54)	.39 (65)	.44 (80)	.24 (39)	.14 (26)
14. Know how well you have either understood or misunderstood what you have read	2.5394	2.5824	.8446	.8151	.13 (21)	.12 (21)	.31 (51)	.28 (51)	.46 (76)	.51 (93)	.10 (17)	.09 (17)
15. Know how well you will be able to remember what you have read	2.7394	2.7143	.7801	.8447	.04 (6)	.09 (16)	.36 (59)	.28 (50)	.43 (72)	.47 (86)	.17 (28)	.16 (30)
16. Remember what you have read a day later	2.7030	2.6484	.8499	.8260	.08 (14)	.07 (13)	.30 (49)	.37 (66)	.45 (74)	.41 (75)	.17 (28)	.15 (28)

TABLE 21B

Question	Mean	Standard Deviation	1 strongly disagree	2 disagree	3 agree	4 strongly agree
1. Spend more time explaining the chapter before I read it	2.8150	.7730	.05 (17)	.26 (90)	.52 (179)	.17 (60)
2. Go over the chapter in class before a test	3.6734	.5649	.006 (2)	.032 (11)	.246 (85)	.716 (248)
3. Tell me which ideas in the Chapter I should remember	3.6647	.5467	.006 (2)	.020 (7)	.277 (96)	.697 (241)
4. Explain how new ideas are related to things I already know	3.3382	.6312	.01 (3)	.06 (21)	.51 (178)	.42 (144)
5. Explain the difficult words in the chapter	3.1618	.6956	.02 (6)	.12 (42)	.54 (188)	.32 (110)
6. Discuss information which the chapter has not covered	3.1420	.8284	.04 (15)	.15 (52)	.43 (147)	.38 (131)
7. Provide me an overview or outline of the chapter	3.0838	.7235	.01 (5)	.18 (62)	.52 (178)	.29 (101)
8. Provide questions to guide my reading of the chapter	3.1536	.6923	.02 (8)	.10 (36)	.57 (196)	.31 (105)

TABLE 21B (continued)

Question	Mean	Standard Deviation	1 strongly disagree	2 disagree	3 agree	4 strongly agree
9. Provide additional material to read (handouts, books, etc.)	2.5983	.8007	.07 (24)	.39 (136)	.41 (141)	.13 (45)
10. Give me time in class to read the text	3.0838	.7663	.03 (11)	.16 (55)	.50 (174)	.31 (106)
11. Let me read the text for myself instead of making reading assignments	2.3884	.8626	.13 (45)	.47 (163)	.28 (95)	.12 (42)
12. Give students time in class to get together and discuss the ideas in the text	2.9827	.8269	.05 (18)	.19 (67)	.48 (164)	.28 (97)
13. Assign additional activities to help me understand the ideas in the chapter	2.7370	.8077	.07 (25)	.27 (95)	.50 (172)	.16 (54)
14. Teach me how to find out which ideas in the chapter are important	3.3256	.6500	.01 (3)	.07 (26)	.50 (173)	.42 (145)
15. Teach me how to find out whether one important idea is related to another	3.1844	.6320	.01 (4)	.09 (31)	.60 (209)	.30 (103)

TABLE 21B (continued)

Question	Mean	Standard Deviation	1 strongly disagree	2 disagree	3 agree	4 strongly agree
16. Spend time teaching reading skills (skimming, previewing)	2.3256	.8157	.14 (49)	.47 (164)	.31 (106)	.08 (28)
17. Spend time teaching study skills (notetaking, outlining, summarizing)	2.4595	.8647	.13 (45)	.40 (138)	.35 (122)	.12 (41)
18. Use a textbook which is easier to read	2.5462	.8231	.08 (28)	.43 (147)	.36 (125)	.13 (46)
19. Use a textbook which is more interesting to read	3.2225	.7836	.02 (7)	.16 (55)	.40 (138)	.42 (146)
20. Use a textbook which is more up-to-date	3.0029	.8392	.03 (11)	.26 (88)	.39 (136)	.32 (111)
21. Not use the textbook at all	1.8000	.8780	.43 (149)	.41 (141)	.09 (30)	.07 (25)

Illinois

TABLE 22A

Biology

1.	review chapter before exam	(98%)
2.	identify which ideas should be remembered	(97.9%)
3.	relate new ideas to ideas students already know	(93%)
4.	explain difficult vocabulary	(90%)
5.	teach students to identify important ideas	(90%)
6.	teach students to identify relationships between ideas	(87%)
7.	discuss information not covered in the chapter	(86%)
8.	use textbook which is more interesting to read	(84%)
9.	provide questions to guide student's reading	(84%)
10.	provide an outline to overview of chapter	(77%)
11.	assign additional activities which will help students understand new ideas	(77%)
12.	provide students with time in class to read	(76%)
13.	use a textbook which is more up-to-date	(76%)
14.	spend more time explaining the chapter before students read it	(73%)
15.	provide students with time in class to get together and discuss ideas	(71%)
16.	provide additional material to read	(58%)
17.	use a textbook which is easier to read	(49%)
18.	spend time teaching study skills	(46%)
19.	spend time teaching reading skills	(37%)
20.	allow students to read textbook on their own rather than making reading assignments	(25%)
21.	cease using the textbook	(12%)

History

1.	identify which ideas should be remembered	(97%)
2.	review chapter before exam	(95%)
3.	relate new ideas to ideas students already know	(93%)
4.	teach students to identify important ideas	(93%)
5.	teach students to identify relationships between ideas	(91%)
6.	provide questions to guide student's reading	(90%)
7.	provide students with time in class to read	(85%)

TABLE 22A (continued)

History

8.	explain difficult vocabulary	(84%)
9.	provide an overview or outline of chapter	(83%)
10.	use textbook which is more interesting to read	(81%)
11.	provide students with time in class to get together and discuss ideas	(79%)
12.	discuss information not covered in chapter	(78%)
13.	use a textbook which is more up-to-date	(68%)
14.	spend more time explaining the chapter before students read it	(66%)
15.	assign additional activities which will help students understand new ideas	(57%)
16.	provide additional material to read	(51%)
17.	allow students to read textbook on their own rather than making reading assignments	(50%)
18.	use textbook which is easier to read	(50%)
19.	spend time teaching study skills	(48%)
20.	spend time teaching reading skills	(40%)
21.	cease using the textbook	(19%)

Illinois

TABLE 22B

Difference between Biology & +History

1.	allow students to read the textbook on their own rather than making reading assignments	(+25%)
2.	assign additional activities which will help students understand new ideas	(-20%)
3.	provide students with time in class to read	(+09%)
4.	provide students with time in class to get together and discuss ideas	(+08%)
5.	discuss information not covered in the chapter	(-08%)
6.	use a textbook which is more up-to-date	(-08%)
7.	spend more time explaining the chapter before students read it	(-07%)
8.	provide additional material to read	(-07%)
9.	cease using the textbook	(+07%)
10.	explain difficult vocabulary	(-06%)
11.	provide an overview or outline of the chapter	(+06%)
12.	provide questions to guide student's reading	(+06%)
13.	teach students to identify relationships between ideas	(+04%)
14.	review chapter before exam	(-03%)
15.	teach students to identify important ideas	(+03%)
16.	spend time teaching reading skills	(+03%)
17.	use a textbook which is more interesting to read	(-03%)
18.	spend time teaching study skills	(+02%)
19.	use a textbook which is easier to read	(+01%)
20.	identify which ideas should be remembered	(-00.9%)
21.	relate new ideas to ideas students already know	(00%)

TABLE 22C

					1		2		3		5	
Question	Mean		Standard Deviation		strongly disagree		disagree		agree		strongly agree	
	B	H	B	H	B	H	B	H	B	H	B	H
1. Spend more time explaining the chapter before I read it	2.8671	2.7783	.7713	.7740	.05 (7)	.05 (10)	.22 (32)	.29 (58)	.54 (77)	.50 (102)	.19 (27)	.16 (33)
2. Go over the chapter in class before a test	3.7413	3.6256	.4852	.6116	.00 (0)	.01 (2)	.02 (3)	.04 (8)	.22 (31)	.27 (54)	.76 (109)	.68 (139)
3. Tell me which ideas in the Chapter I should remember	3.6993	3.6404	.5312	.5573	.007 (1)	.005 (1)	.014 (2)	.025 (5)	.252 (36)	.295 (60)	.727 (104)	.675 (137)
4. Explain how new ideas are related to things I already know	3.3706	3.3153	.6244	.6364	.01 (1)	.01 (2)	.06 (8)	.06 (13)	.49 (71)	.53 (107)	.44 (63)	.40 (81)
5. Explain the difficult words in the chapter	3.2028	3.1330	.6772	.7085	.02 (3)	.01 (3)	.08 (12)	.15 (30)	.57 (81)	.53 (107)	.33 (47)	.31 (63)
6. Discuss information which the chapter has not covered	3.2797	3.0446	.7450	.8713	.01 (2)	.06 (13)	.13 (19)	.16 (33)	.42 (59)	.44 (88)	.44 (63)	.34 (68)
7. Provide me an overview or outline of the chapter	3.0000	3.1422	.7244	.7188	.01 (2)	.02 (3)	.22 (31)	.15 (31)	.52 (74)	.51 (104)	.25 (35)	.32 (66)
8. Provide questions to guide my reading of the chapter	3.0071	3.2549	.7121	.6612	.04 (6)	.01 (2)	.12 (17)	.09 (19)	.63 (88)	.53 (108)	.21 (30)	.37 (75)

TABLE 22C (continued)

					1		2		3		4	
Question	Mean		Standard Deviation		strongly disagree		disagree		agree		strongly agree	
	B	H	B	H	B	H	B	H	B	B	B	H
9. Provide additional material to read (handouts, books, etc.)	2.6479	2.5637	.7551	.8310	.05 (7)	.08 (17)	.37 (53)	.41 (83)	.46 (65)	.37 (76)	.12 (17)	.14 (28)
10. Give me time in class to read the text	2.9648	3.1667	.7447	.7699	.03 (4)	.03 (7)	.21 (30)	.12 (25)	.53 (75)	.49 (99)	.23 (33)	.36 (73)
11. Let me read the text for myself instead of making reading assignments	2.1197	2.5764	.7943	.8605	.20 (28)	.08 (17)	.55 (78)	.42 (85)	.19 (27)	.34 (68)	.06 (9)	.16 (33)
12. Give students time in class to get together and discuss the ideas in the text	2.8169	3.0980	.7956	.8306	.06 (9)	.04 (9)	.23 (33)	.17 (34)	.53 (75)	.44 (89)	.18 (25)	.35 (72)
13. Assign additional activities to help me understand the ideas in the chapter	2.9155	2.6127	.7579	.8197	.05 (7)	.09 (18)	.18 (26)	.34 (69)	.57 (81)	.44 (91)	.20 (28)	.13 (26)
14. Teach me how to find out which ideas in the chapter are important	3.3357	3.3186	.6494	.6520	.00 (0)	.01 (3)	.10 (14)	.06 (12)	.47 (67)	.52 (106)	.43 (62)	.41 (83)
15. Teach me how to find out whether one important idea is related to another	3.1538	3.2059	.6425	.6252	.01 (1)	.02 (3)	.12 (17)	.07 (14)	.59 (84)	.61 (125)	.28 (41)	.30 (62)

TABLE 22C (continued)

Question	Mean		Standard Deviation		1 strongly disagree		2 disagree		3 agree		4 strongly agree	
	B	H	B	H	B	H	B	H	B	H	B	H
16. Spend time teaching reading skills (skimming, previewing)	2.2867	2.3529	.8103	.8203	.15 (22)	.13 (27)	.48 (68)	.47 (96)	.30 (43)	.31 (63)	.07 (10)	.09 (18)
17. Spend time teaching study skills (notetaking, outlining, summarizing)	2.4266	2.4828	.8998	.8405	.15 (22)	.11 (23)	.39 (56)	.41 (82)	.33 (47)	.37 (75)	.13 (18)	.11 (23)
18. Use a textbook which is easier to read	2.5455	2.5468	.8025	.8393	.07 (10)	.09 (18)	.44 (63)	.41 (84)	.36 (52)	.36 (73)	.13 (18)	.14 (28)
19. Use a textbook which is more interesting to read	3.2378	3.2118	.7502	.8080	.01 (2)	.02 (5)	.15 (21)	.17 (34)	.43 (61)	.38 (77)	.41 (59)	.43 (87)
20. Use a textbook which is more up-to-date	3.0769	2.9507	.7968	.8660	.02 (3)	.04 (8)	.22 (31)	.28 (57)	.43 (61)	.37 (75)	.33 (48)	.31 (63)
21. Not use the textbook at all	1.6993	1.8713	.8561	.8884	.49 (70)	.39 (79)	.39 (56)	.42 (85)	.05 (7)	.12 (23)	.07 (10)	.07 (15)

Illinois

TABLE 23A

Male

1.	identify which ideas should be remembered	(95%)
2.	review chapter before exam	(94%)
3.	relate new ideas to ideas students already know	(92%)
4.	teach students to identify important ideas	(92%)
5.	teach students to identify relationships between ideas	(90%)
6.	use textbook which is more interesting to read	(84%)
7.	explain difficult vocabulary	(83%)
8.	discuss information not covered in the chapter	(83%)
9.	provide to guide students' readings	(81%)
10.	provide students with time in class to read	(80%)
11.	provide an outline or overview of the chapter	(79%)
12.	provide students with time in class to get together and discuss ideas	(75%)
13.	use a textbook which is more up-to-date	(71%)
14.	spend more time explaining the chapter before students read it	(68%)
15.	assign additional activities which will help students understand new ideas	(59%)
16.	provide additional material to read	(52%)
17.	use a textbook which is easier to read	(51%)
18.	spend time teaching study skills	(48%)
19.	allow students to read textbook on their own rather than making reading assignments	(43%)
20.	spend time teaching reading skills	(39%)
21.	cease using the textbook	(18%)

Female

1.	identify which ideas should be remembered	(99%)
2.	review chapter before exam	(99%)
3.	relate new ideas to ideas students already know	(94%)
4.	provide questions to guide students' reading	(93%)
5.	teach students to identify important ideas	(92%)
6.	teach students to identify relationships between ideas	(90%)
7.	explain difficult vocabulary	(89%)

TABLE 23A (continued)

8.	provide an overview or outline of the chapter	(82%)
9.	provide students with time in class to read	(82%)
10.	use a textbook which is more interesting to read	(80%)
11.	discuss information not covered in the chapter	(78%)
12.	provide students with time in class to get together and discuss ideas	(75%)
13.	assign additional activities which will help students understand new ideas	(72%)
14.	use a textbook which is more up-to-date	(71%)
15.	spend more time explaining the chapter before students read it	(70%)
16.	provide additional material to read	(56%)
17.	use a textbook which is easier to read	(48%)
18.	spend time teaching study skills	(47%)
19.	spend time teaching reading skills	(39%)
20.	allow students to read textbook on their own rather than making reading assignments	(37%)
21.	cease using the textbook	(14%)

Illinois

TABLE 23B

Difference between +male & female

1.	assign additional activities which will help students understand new ideas	(-13%)
2.	provide questions to guide students' reading	(-12%)
3.	explain difficult vocabulary	(-06%)
4.	allow students to read textbook on their own rather than making reading assignments.	(+06%)
5.	review chapter before exam	(-05%)
6.	discuss information not covered in the chapter	(+05%)
7.	identify which ideas should be remembered	(-04%)
8.	provide additional material to read	(-04%)
9.	use a textbook which is more interesting to read	(-04%)
10.	cease using the textbook	(+04%)
11.	provide an overview or outline of the chapter	(-03%)
12.	use a textbook which is easier to read	(+03%)
13.	spend more time explaining the chapter before students read it	(-02%)
14.	relate new ideas to ideas students already know	(-02%)
15.	provide students with time in class to read	(-02%)
16.	spend time teaching study skills	(+01%)
17.	provide students with time in class to get together and discuss ideas	(00%)
18.	teach students to identify important ideas	(00%)
19.	teach students to identify relationships between ideas	(00%)
20.	spend time teaching reading skills	(00%)
21.	use a textbook which is more up-to-date	(00%)

TABLE 23C

Question	Mean		Standard Deviation		1 strongly disagree		2 disagree		3 agree		4 strongly agree	
	M	F	M	F	M	F	M	F	M	F	M	F
1. Spend more time explaining the chapter before I read it	2.8061	2.8232	.7481	.7970	.04 (6)	.06 (11)	.28 (47)	.24 (43)	.52 (85)	.52 (94)	.16 (27)	.18 (33)
2. Go over the chapter in class before a test	3.5697	3.7680	.6554	.4488	.01 (2)	.00 (0)	.05 (9)	.01 (2)	.29 (47)	.21 (38)	.65 (107)	.78 (141)
3. Tell me which ideas in the chapter I should remember	3.5394	3.7790	.6295	.4292	.01 (2)	.00 (0)	.04 (6)	.01 (1)	.35 (58)	.21 (38)	.60 (99)	.78 (142)
4. Explain how new ideas are related to things I already know	3.2970	3.3757	.6646	.5984	.02 (3)	.00 (0)	.06 (10)	.06 (11)	.53 (87)	.50 (91)	.39 (65)	.44 (79)
5. Explain the difficult words in the chapter	3.0970	3.2210	.6916	.6959	.01 (2)	.02 (4)	.16 (26)	.09 (16)	.55 (91)	.54 (97)	.28 (46)	.35 (64)
6. Discuss information which the chapter has not covered	3.1818	3.1056	.7984	.8555	.04 (6)	.05 (9)	.13 (22)	.17 (30)	.44 (73)	.41 (74)	.39 (64)	.37 (67)
7. Provide me an overview or outline of the chapter	3.0545	3.1105	.7671	.6823	.03 (5)	.00 (0)	.18 (29)	.18 (33)	.50 (83)	.53 (95)	.29 (48)	.29 (53)
8. Provide questions to guide my reading of the chapter	3.0242	3.2722	.7567	.6057	.04 (7)	.01 (1)	.15 (24)	.06 (12)	.56 (92)	.58 (104)	.25 (42)	.35 (63)

TABLE 23C (continued)

Question	Mean		Standard Deviation		1 strongly disagree		2 disagree		3 agree		4 strongly agree	
	M	F	M	F	M	F	M	F	M	F	M	F
9. Provide additional material to read (handouts, books, etc.)	2.5636	2.6298	.8431	.7608	.09 (15)	.05 (9)	.39 (65)	.39 (71)	.38 (62)	.44 (79)	.14 (23)	.12 (22)
10. Give me time in class to read the text	3.1091	3.0608	.8041	.7316	.04 (6)	.03 (5)	.16 (27)	.15 (28)	.45 (75)	.55 (99)	.35 (57)	.27 (49)
11. Let me read the text for myself instead of making reading assignments	2.4788	2.3056	.9278	.7917	.13 (21)	.13 (24)	.44 (73)	.50 (90)	.25 (42)	.30 (53)	.18 (29)	.07 (13)
12. Give students time in class to get together and discuss the ideas in the text	3.000	2.9669	.8337	.8226	.05 (8)	.06 (10)	.20 (33)	.19 (34)	.45 (75)	.49 (89)	.30 (49)	.26 (48)
13. Assign additional activities to help me understand the ideas in the chapter	2.6061	2.8564	.8315	.7684	.10 (17)	.04 (8)	.31 (51)	.24 (44)	,47 (77)	.53 (95)	.12 (20)	.19 (34)
14. Teach me how to find out which ideas in the chapter are important	3.2970	3.3516	.6738	.6285	.02 (3)	.00 (0)	.06 (11)	.08 (15)	.52 (85)	.49 (88)	.40 (66)	.43 (79)
15. Teach me how to find out whether one important idea is related to another	3.1636	3.2033	.6653	.6015	.02 (4)	.00 (0)	.08 (13)	.10 (18)	.61 (100)	.60 (109)	.29 (48)	.30 (55)

TABLE 23C (continued)

Question	Mean		Standard Deviation		1		2		3		4	
					strongly disagree		disagree		agree		strongly agree	
	M	F	M	F	M	F	M	F	M	F	M	F
16. Spend time teaching reading skills (skimming, previewing)	2.3152	2.3352	.8611	.7744	.16 (27)	.12 (22)	.45 (75)	.49 (89)	.29 (47)	.32 (59)	.10 (16)	.07 (12)
17. Spend time teaching study skills (notetaking, outlining, summarizing)	2.4207	2.4945	.9066	.8260	.17 (28)	.09 (17)	.35 (58)	.44 (80)	.36 (59)	.35 (63)	.12 (19)	.12 (22)
18. Use a textbook which is easier to read	2.5818	2.5138	.7577	.8794	.05 (8)	.11 (20)	.44 (72)	.41 (75)	.40 (66)	.33 (59)	.11 (19)	.15 (27)
19. Use a textbook which is more interesting to read	3.2667	3.1823	.7897	.7781	.02 (4)	.02 (3)	.14 (23)	.18 (32)	.38 (63)	.41 (75)	.46 (75)	.39 (71)
20. Use a textbook which is more up-to-date	2.9636	3.0387	.8688	.8122	.06 (9)	.01 (2)	.23 (38)	.28 (50)	.41 (68)	.37 (68)	.30 (50)	.34 (61)
21. Not use the textbook at all	1.8405	1.7637	.9225	.8371	.43 (70)	.43 (79)	.39 (63)	.43 (78)	.10 (16)	.08 (14)	.08 (14)	.06 (11)

TABLE 23D

Biology

Difference between +males & females

1.	assign additional activities which will help students understand new ideas	(-14%)
2.	provide additional material to read	(-13%)
3.	provide questions to guide students' reading	(-11%)
4.	provide students with time in class to get together and discuss ideas	(-11%)
5.	explain difficult vocabulary	(-07%)
6.	review chapter before exam	(-06%)
7.	relate new ideas to ideas students already know	(-06%)
8.	provide students with time in class to read	(-06%)
9.	use textbook which is easier to read	(+06%)
10.	identify which ideas should be remembered	(-04%)
11.	spend more time explaining the chapter before students read it	(+03%)
12.	allow students to read textbook on their own rather than making reading assignments	(+03%)
13.	spend time teaching study skills	(+03%)
14.	use a textbook which is more interesting to read	(-03%)
15.	discuss information not covered in chapter	(-02%)
16.	provide an outline or overview of chapter	(-01%)
17.	teach students to identify relationships between ideas	(-01%)
18.	use a textbook which is more up-to-date	(-01%)
19.	cease using the textbook	(-01%)
20.	spend time teaching reading skills	(00%)
21.	teach students to identify important ideas	(00%)

TABLE 23E

History

Difference between +males & females

1.	provide questions to guide students' reading	(-13%)
2.	discuss information not covered in the chapter	(+11%)
3.	assign additional activities which will help students	(-09%)
4.	review chapter before exam	(-08%)
5.	use a textbook which is more interesting to read	(-08%)
6.	cease using the textbook	(+08%)
7.	provide students with time in class to get together and discuss ideas	(+06%)
8.	allow students to read textbook on their own rather than making reading assignments	(+05%)
9.	explain difficult vocabulary	(-05%)
10.	identify which ideas should be remembered	(-04%)
11.	provide an outline or overview of chapter	(-04%)
12.	use a textbook which is easier to read	(+03%)
13.	provide additional material to read	(+02%)
14.	spend time teaching reading skills	(-02%)
15.	use a textbook which is more up-to-date	(+02%)
16.	spend more time explaining the chapter before students read it	(+01%)
17.	relate new ideas to ideas students already know	(+01%)
18.	teach students to identify relationships between ideas	(-01%)
19.	spend time teaching study skills	(-01%)
20.	provide students with time in class to read	(00%)
21.	teach students to identify important ideas	(00%)

TABLE 23F

Difference between +History males & Biology males

1.	allow students to read textbook on their own rather than making reading assignments	(+25%)
2.	review chapter before exam	(+18%)
3.	provide students with time in class to get together and discuss ideas	(+18%)
4.	assign additional activities which will help students understand new ideas	(-16%)
5.	cease using the textbook	(+12%)
6.	provide students with time in class to read	(+11%)
7.	use a textbook which is more up-to-date	(+07%)
8.	provide questions to guide students' reading	(+06%)
9.	explain difficult vocabulary	(-05%)
10.	provide an outline or overview of the chapter	(+05%)
11.	teach students to identify relationships between ideas	(+04%)
12.	relate new ideas to ideas students already know	(+03%)
13.	teach students to identify important ideas	(+03%)
14.	use a textbook which is more interesting to read	(+03%)
15.	spend more time explaining the chapter before students read it	(-02%)
16.	provide additional material to read	(+02%)
17.	spend time teaching reading skills	(+02%)
18.	identify which ideas should be remembered	(-01%)
19.	discuss information not covered in the chapter	(-01%)
20.	spend time teaching study skills	(+01%)
21.	use a textbook which is easier to read	(-01%)

Illinois--Part IV TABLE 23G

Difference between +History females & Biology females

1.	allow students to read textbook on their own rather than making reading assignments	(+23%)
2.	assign additional activities which will help students understand new ideas	(-21%)
3.	review chapter before exam	(+20%)
4.	discuss information not covered in the chapter	(-14%)
5.	provide additional material to read	(-13%)
6.	use a textbook which is more up-to-date	(-10%)
7.	provide an overview or outline of the chapter	(+08%)
8.	provide questions to guide students' reading	(+08%)
9.	use a textbook which is more interesting to read	(-08%)
10.	explain difficult vocabulary	(-07%)
11.	provide students with time in class to read	(+05%)
12.	spend time teaching study skills	(+05%)
13.	relate new ideas to ideas students already know	(-04%)
14.	teach students to identify relationships between ideas	(+04%)
15.	spend time teaching reading skills	(+04%)
16.	teach students to identify important ideas	(+03%)
17.	cease using the textbook	(-03%)
18.	use a textbook which is easier to read	(+02%)
19.	identify which ideas should be remembered	(-01%)
20.	provide students with time in class to get together and discuss ideas	(+01%)
21.	spend more time explaining the chapter before students read it	(00%)

TABLE 24

	N = 347 Total	n = 204 History	n = 143 Biology
I. (item 18) Describe step by step how you study a textbook chapter. Be sure to include any additional methods of study you use which are not mentioned above.			
class notes	23(.066)	9(.44)	14(.098)
worksheets/handouts	38(.11)	31(.15)	7(.048)
study pictures	4(.012)	2(.01)	2(.014)
look up words in the glossary	-	-	2(.014)
class assignments	-	-	2(.014)
films/filmstrips	-	2(.01)	-
II. (item 13) Please describe any other strengths and weakness of your textbook.			
Strengths:			
inclusion of pictures, charts, maps, graphs, diagrams	38(.11)	13(.062)	25(.173)
boldface print	23(.066)	14(.019)	19(.133)
defines word clearly	-	-	10(.069)
index	-	-	4(.019)
Weaknesses:			
text is boring	29(.083)	21(.103)	8(.056)
no glossary/need better glossary	8	2(.009)	6(.042)
chapters too long/too many topics in a topic	5(.014)	3(.015)	2(.014)
not enough pictures/diagrams	-	-	7(.048)
dates not reported chronologically	-	7(.034)	-
drawings unrealistic	-	-	4(.028)
III. (item 19) Please describe any other difficulties you have when you study a chapter in your text.			
text is boring	27(.078)	10(.049)	17(.119)
chapters too long	3(.009)	2(.009)	1(.007)
not enough time	-	3(.015)	-
classmates talking	-	3(.015)	-
hard to visualize things	-	-	1(.007)
IV. (item 22) Please describe anything else you would suggest the teacher might do to help you study a chapter in your text			
administer practice tests/quizes	7(.020)	3(.015)	4(.028)
show more films	-	10(.049)	-
provide notes	-	-	3(.021)
field trips	-	3(.015)	-
shorter assignments	-	3(.015)	
go over test after test has been taken	-	-	2(.014)
require more lab work	-		2(.014)
require more projects	-	-	2(.014)
allow more time	-	2(.009)	-

Appendix D

Complete Set of Texts, Maps, and Lists of Relationship Propositions

(refer to Section III, Part 2)

#101 Metamorphosis of the Frog

(no heading)

The change to an adult frog is amazing. First, hind legs appear on the tadpole's fishlike body. The front legs start to form at about the same time. But they remain hidden under the tadpole's fish-like operculum for a while. When the front legs do appear, the tadpole starts resorbing its tail. The tadpole does not shed or eat the tail.

Near the end of the metamorphosis, the mouth broadens and teeth develop. As these external changes happen, internal changes also occur. A saclike chamber, resembling the swim bladder of a fish, forms behind the tadpole's throat. This divides into two sacs, which become the lungs. The heart develops three chambers. The gill arteries change into the carotids, aortic arches, and pulmocutaneous arteries. Soon the gills stop functioning and the tadpole starts swimming to the water's surface to gulp air. At this time, the tadpole's thin skin and broad, flat tail still play important roles in respiration.

Even before the tail is completely resorbed, the tadpole starts moving out on the land. From this point, the tadpole is considered a young frog. The young frog usually takes about a month to become a full-grown frog.

The metamorphosis of the leopard frog takes from two to three months. Adult leopard frogs usually appear around July first. Bullfrogs usually spend two winters as tadpoles. And it may be three years before the adult bullfrog is fully formed.

# 101--METAMORPHOSIS OF THE FROG

DEF: the change to an adult frog

is amazing

- First (phase)
  - hind legs appear on tadpole's body
    - fish-like
  - front legs start to form
    - at about the same time (as hind legs)
    - (but) they remain hidden
      - under operculum
        - fish-like
      - for a while

→

- Front legs do appear
  - tadpole starts resorbing tail
  - tadpole does not shed or eat the tail

→

→

- Near the end of metamorphosis
  - external changes happen
    - mouth broadens
    - teeth develop
  - internal changes also occur
    - sac-like chamber (forms)
      - resembles the swim bladder of a fish
      - forms behind tadpole's throat
      - → divides into two sacs → becomes the lungs
    - heart develops three chambers
    - gill arteries change
      - into the carotids
      - into aortic arches
      - into pulmocutanious arteries
    - respiration (changes)
      - gills stop functioning → tadpole starts swimming to water's surface
        - to gulp air
      - tadpole's thin skin still plays important role in respiration
      - tadpole's broad tail still plays important role in respiration

→

- tadpole starts moving out on land
  - before tail completely resorbed
  - tadpole is considered a young frog
    - from this point on

→

- becomes a full-grown frog
  - usually takes about a month

- metamorphosis of leopard frog
  - takes two to three months
  - adults appear around July 1

- metamorphosis of bullfrog
  - usually spend 2 winters as tadpole
  - may be 3 years → adult fully formed

#101: METAMORPHOSIS OF THE FROG

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.1	0 metamorphosis of the frog	0 DEF	1 change to an adult frog
2.	1.2	0 metamorphosis of the frog	1 PROP	1 is amazing
3.	1.3	0 metamorphosis of the frog	0 PROP	0 Rel. Props. # 6,13,16,37,41
4.	2.2	1 first (phase)	1 PROP	1 hind legs appear on tadpole's body
5.	2.22	1 tadpole's body	1 PROP	1 fish-like
6.	2.2	1 first (phase)	1 PROP	1 front legs start to form
7.	2.22	1 front legs start to form	1 PROP	1 at about the same time (as the hind legs)
8.	2.22	1 front legs start to form	1 PROP	1 they remain hidden
9.	2.25	1 front legs start to form	1 NOT SIM	1 they remain hidden
10.	2.222	1 they remain hidden	1 PROP	1 under operculum
11.	2.2222	1 operculum	1 PROP	1 fish-like
12.	2.222	1 they remain hidden	1 PROP	1 for awhile
13.	2.6	1 first (phase)	0 PREC	1 front legs do appear
14.	3.2	1 front legs do appear	1 PROP	1 tadpole starts resorbing its tail
15.	3.2	1 front legs do appear	0 PROP	1 tadpole does not shed or eat the tail

#101: METAMORPHOSIS OF THE FROG

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	0	1
16.	3.6	front legs do appear	PREC	near the end of metamorphosis
		1	0	1
17.	4.2	near the end of metamorphosis	PROP	external changes happen
		1	0	1
18.	4.23	external changes happen	EXAMP	mouth broadens
		1	0	1
19.	4.23	external changes happen	EXAMP	teeth develop
		1	0	1
20.	4.2	near the end of metamorphosis	PROP	internal changes also occur
		1	0	0
21.	4.23	internal changes also occur	EXAMP	Rel. Props. # 22,24,25
		1	1	1
22.	4.232	saclike chamber (forms)	PROP	resembles the swim bladder of a fish
		1	1	1
23.	4.232	saclike chamber (forms)	PROP	forms behind tadpole's throat
		1	0	1
24.	4.236	saclike chamber (forms)	PREC	divides into two sacs
		1	0	1
25.	4.236	divides into two sacs	PREC	becomes the lungs
		1	0	1
26.	4.23	internal changes also occur	EXAMP	heart develops three chambers
		1	0	1
27.	4.23	internal changes also occur	EXAMP	gill arteries change
		1	0	1
28.	4.233	gill arteries change	EXAMP	into the carotoids
		1	0	1
29.	4.233	gill arteries change	EXAMP	into aortic arches
		1	0	0
30.	4.233	gill arteries change	EXAMP	into pulmocutaneous arteries

#101: METAMORPHOSIS OF THE FROG

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
31.	4.23	1 internal changes also occur	0 EXAMP	0 respiration (changes)
32.	4.232	0 respiration (changes)	0 PROP	0 Rel. Props.# 33
33.	4.2327	1 gills stop functioning	0 CAUS	1 tadpole starts swimming to the water's surface
34.	4.23272	1 tadpole starts swimming to the water's surface	1 PROP	1 to gulp air
35.	4.232	0 respiration changes	0 PROP	1 tadpole's thin skin still plays important role in respiration
36.	4.232	0 respiration changes	0 PROP	1 tadpole's broad tail still plays important role in respiration
37.	4.6	1 near the end of metamorphosis	0 PREC	1 tadpole starts moving out on land
38.	5.2	1 tadpole starts moving out on land	1 PROP	1 before tail is completely resorbed
39.	5.2	1 tadpole starts moving out on land	1 PROP	1 tadpole considered a young frog
40.	5.22	1 tadpole considered a young frog	1 PROP	1 from this point on
41.	5.6	1 tadpole starts moving out on land	1 PREC	1 becomes a full grown frog
42.	5.6	1 becomes a full grown frog	1 PROP	1 usually takes about a month
43.	1.3	0 metamorphosis of the frog	0 EXAMP	1 metamorphosis of leopard frog

#101: METAMORPHOSIS OF THE FROG

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
44.	1.32	1 metamorphosis of leopard frog	1 PROP	1 takes 2 to 3 months
45.	1.32	1 metamorphosis of leopard frog	1 PROP	1 adults appear around July 1
46.	1.3	0 metamorphosis of the frog	0 EXAMP	1 metamorphosis of bullfrogs
47.	1.32	1 metamorphosis of bullfrogs	1 PROP	1 usually spend 2 winters as tadpoles
48.	1.32	1 metamorphosis of bullfrogs	1 PROP	1 may be 3 years before adult is fully formed
49.	1.326	1 may be 3 years	1 PREC	1 adult fully formed

#102--Circulatory System of the Frog

The Circulatory System

The circulatory system of the frog is a step more complex than that of the fish. This represents a step toward the higher vertebrates. One of these advances is the heart. The frog heart has three chambers. There are two atria (auricles) and a muscular ventricle. Deoxygenated blood flows into the right atrium from various parts of the body. When the lungs are used, oxygenated blood from the lungs flows into the left atrium. Both atria contract at the same time. This forces blood into the ventricle. The ventricle then contracts and pumps blood out of the heart. The blood leaves through a large vessel that lies against the front side of the heart. This is called the conus arteriousus. This large vessel immediately divides into two branches, the right and left truncus arteriosus. Each of these again branches into three arches. The anterior pair are the carotid arches. These carry blood to the head. The middle pair are the aortic arches. They transport blood around the right and left sides of the heart. They join below the liver to form the dorsal aorta. This great artery carries blood to muscles, the digestive organs, and other parts of the body. The posterior pair of arches are called the pulmocutaneous arches. They carry blood to the lungs, skin and mouth.

The blood that returns to the frog's heart, after a trip through the body, has lost most of its oxygen. This blood is loaded with carbon dioxide and other cell wastes. Three large veins carry blood back to the heart. These are called the venae cavae. They join a triangle-shaped, thin-walled sac, called the sinus venosus, at the back of the heart. This empties into the right atrium.

102--CIRCULATORY SYSTEM OF THE FROG

Complex > circulatory system of the fish

complex

a step more

represents a step toward the higher vertebrates

characterized by a number of advances

the frog heart

one of these advances

has three chambers

two atria

≈ (or) auricles

right atrium

deoxygenated blood flows into here

from various parts of the body

left atrium

oxygenated blood flows into here

from the lungs

when the lungs are used

ventricle

muscular

A trip through the body

both artria contract at the same time ⇒ forces blood into ventricle → ventricle contracts ⇒

⇒ ventricle pumps blood out of the heart

blood leaves through a large vessel

lie against the front side of the heart

called conus arteriosus

→ immediately divides into 2 branches →

right truncus arteriosus

left truncus arteriosus

→ each branches into 3 arches →

anterior pair

called carotoid arches

carry blood to the head

posterix pair

called pulmocutaneous arches

to lungs

to skin

to mouth

middle pair

called aortic arches

transport blood around the right and left sides of the heart

↓

join below the liver

to form the dorsal aorta

great artery

carries blood

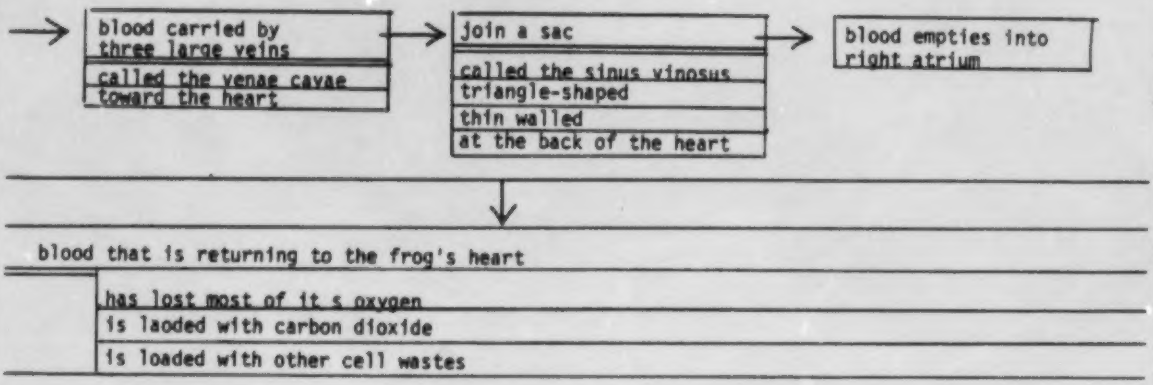
to muscles

to digestive organs

to other parts of the body

(continued)

(continuation of # 102)


blood carried by three large veins
called the venae cavae
toward the heart
join a sac
called the sinus vinosus
triangle-shaped
thin walled
at the back of the heart
blood empties into right atrium
blood that is returning to the frog's heart
has lost most of it s oxygen
is laoded with carbon dioxide
is loaded with other cell wastes

#102: CIRCULATORY SYSTEM OF THE FROG

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	1 circulatory system of the frog	1 PROP	1 complex
2.	1.28	1 complex	1 MOR TH	1 rel. Props. #3
3.	1.282	1 circulatory system of the fish	1 PROP	1 complex
4.	1.22	1 complex	1 PROP	1 a step more
5.	1.22	0 complex	0 PROP	1 represents a step toward the higher vertebrates
6.	1.222	1 represents a step toward the higher vertebrates	0 PROP	0 characterized by a number of advances
7.	1.2223	0 characterized by a number of examples	1 EXAMP	1 the frog heart
8.	2.2	1 the frog heart	1 PROP	1 one of these advances
9.	2.2	1 the frog heart	1 PROP	1 has three chambers
10.	2.23	1 has three chambers	1 EXAMP	1 two atria
11.	2.234	1 two atria	0 SIM	1 auricles
12.	2.233	1 two atria	0 EXAMP	1 right atrium
13.	2.2332	1 right atrium	1 PROP	1 deoxygenated blood flows into here
14.	2.23322	1 deoxygenated blood flows into here	1 PROP	1 from various parts of the body

#102: CIRCULATORY SYSTEM OF THE FROG

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
15.	2.233	1 two atria	0 EXAMP	1 left atrium
16.	2.2332	1 left atrium	1 PROP	1 oxygenated blood flows into here
17.	2.23322	1 oxygenated blood flows into here	1 PROP	1 from the lungs
18.	2.23322	1 oxygenated blood flows into here	1 PROP	1 when the lungs are used
19.	2.23	1 has three chambers	1 EXAMP	1 ventricle
20.	2.232	1 ventricle	1 PROP	1 muscular
21.	1.2	1 circulatory system of the frog	0 PROP	0 a trip through the body
22.	3.2	0 a trip through the body	0 PROP	1 Rel. Props. #23,24,25,26,29,32, 52,55,60
23.	3.27	1 both atria contract at same time	1 CAUS	1 forces blood into ventricle
24.	3.276	1 forces blood into ventricle	1 PREC	1 ventricle contracts
25.	3.2767	1 ventricle contracts	0 CAUS	1 ventricle pumps blood out of the heart
26.	3.27672	1 ventricle pumps blood out of the heart	0 PROP	1 blood leaves through a large vessel
27.	3.27672	1 blood leaves through a large vessel	1 PROP	1 lies against the frontside of the heart

#102: CIRCULATORY SYSTEM OF THE FROG

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
28.	3.276722	1 blood leaves through a large vessel	1 PROP	1 called conus arteriosus
29.	3.276726	1 blood leaves through a large vessel	0 PREC	1 immediately divides into two branches
30.	3.2767263	1 two branches	1 EXAMP	1 right truncus arteriosus
31.	3.2767263	1 two branches	1 EXAMP	1 left truncus arteriosus
32.	3.2767266	1 immediately divides into two branches	0 PREC	1 each branches into three arches
33.	3.63	1 each branches into three arches	1 EXAMP	1 anterior pair
34.	3.632	1 anterior pair	1 PROP	1 called carotid arches
35.	3.632	1 anterior pair	1 PROP	1 carry blood to the head
36.	3.63	1 each branches into three arches	1 EXAMP	1 middle pair
37.	3.632	1 middle pair	1 PROP	1 called aortic arches
38.	3.632	1 middle pair	1 PROP	1 transport blood around the right and left sides of heart
39.	3.6326	1 transport blood around the right and left sides of heart	0 PREC	1 join below the liver
40.	3.63262	1 join below the liver	1 PROP	1 to form the dorsal aorta

#102: CIRCULATORY SYSTEM OF THE FROG

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
41.	3.632622	1 the dorsal aorta	1 PROP	1 great artery
42.	3.632622	1 the dorsal aorta	1 PROP	1 carries blood
43.	3.6326223	1 carries blood	1 EXAMP	1 to muscles
44.	3.6326223	1 carries blood	1 EXAMP	1 to digestive organs
45.	3.6326223	1 carries blood	1 EXAMP	1 to other parts of the body
46.	3.63	1 each branches into three arches	1 EXAMP	1 posterior pair
47.	3.632	1 posterior pair	1 PROP	1 called pulmocutaneous arches
48.	3.632	1 posterior pair	1 PROP	1 carry blood
49.	3.6323	1 carry blood	1 EXAMP	1 to lungs
50.	3.6323	1 carry blood	1 EXAMP	1 to skin
51.	3.6323	1 carry blood	1 EXAMP	1 to mouth
52.	3.66	1 each branches into three arches	0 PREC	1 blood carried by three large veins
53.	4.2	1 blood carried by three large veins	1 PROP	1 called the venae cavae
54.	4.2	1 blood carried by three large veins	1 PROP	1 towards the heart

#102: CIRCULATORY SYSTEM OF THE FROG

#	embed-dedness		CONCEPT A		RELATION-SHIP		CONCEPT B
55.	4.6	1	blood carried by three large veins	1	PREC	1	join a sac
56.	4.62	1	join a sac	1	PROP	1	called the sinus vinosus
57.	4.62	1	join a sac	1	PROP	1	triangle-shaped
58.	4.62	1	join a sac	1	PROP	1	thin walled
59.	4.62	1	join a sac	1	PROP	1	at the back of the heart
60.	4.66	1	join a sac	0	PREC	1	blood empties into right atrium
61.	3.6	1	a trip through the body	1	PREC	1	blood that is returning to the frog's heart
62.	3.62	1	blood that is returning to the frog's heart	1	PROP	1	has lost most of its oxygen
63.	3.62	1	blood that is returning to the frog's heart	1	PROP	1	is loaded with carbon dioxide
64.	3.62	1	blood that is returning to the frog's heart	1	PROP	1	is loaded with other cell wastes

#103--Structures of a Snake's Head

The Structures of a Snake's Head

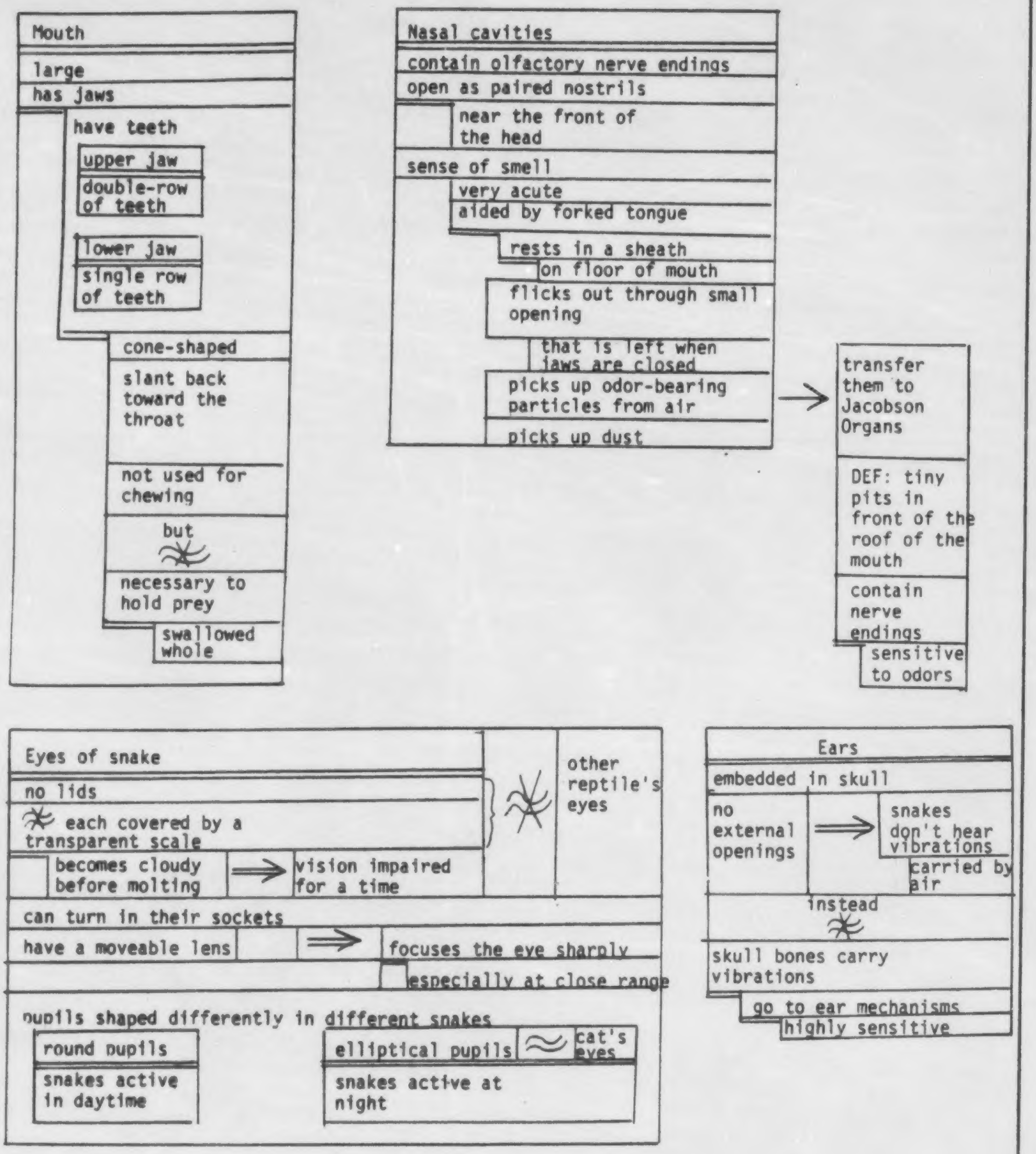
The snake's mouth is large. On the upper jaws there is a double row of teeth. On the lower jaw is a single row. These teeth are not used for chewing. But they are necessary to hold prey, which is swallowed whole.

Snakes have a very acute sense of smell. Olfactory never endings lie in the nasal cavities. These cavities open as paired nostrils near the front of the head. The sense of smell is aided by a forked tongue. This tongue rests in a sheath on the floor of the mouth. It flicks out through a small opening that is left when the jaws are closed. The tongue picks up dust and odor-bearing particles from the air. And it transfers them to tiny pits in the front of the roof of the mouth. These pits are called Jacobson's organs. They contain nerve endings that are very sensitive to odors.

Unlike other reptiles, snakes have no lids on their eyes. Instead, a transparent scale covers each eye. Just before molting, this scale becomes cloudy. This makes vision difficult for a time. The eyes can turn in their sockets. And a moveable lens focuses the eye sharply, especially at close range. Different snakes have different shaped pupils in their eyes. Those most active in daylight have round pupils. Those most active at night have elliptical pupils similar to those of cats.

The ears are embeded in the skull. There are no external openings. Thus, the snake cannot hear vibrations carried by air. Instead, the skull bones carry vibrations to the highly sensitive ear mechanisms.

103--STRUCTURES OF A SNAKE'S HEAD



Mouth
- large
- has jaws
  - have teeth
    - upper jaw
      - double-row of teeth
    - lower jaw
      - single row of teeth
    - cone-shaped
    - slant back toward the throat
    - not used for chewing
    - but ✱
    - necessary to hold prey
      - swallowed whole

Nasal cavities
- contain olfactory nerve endings
- open as paired nostrils
  - near the front of the head
- sense of smell
  - very acute
  - aided by forked tongue
    - rests in a sheath
      - on floor of mouth
    - flicks out through small opening
      - that is left when jaws are closed
    - picks up odor-bearing particles from air → transfer them to Jacobson Organs
      - DEF: tiny pits in front of the roof of the mouth
      - contain nerve endings
        - sensitive to odors
    - picks up dust

Eyes of snake ✱ other reptile's eyes
- no lids
- ✱ each covered by a transparent scale
  - becomes cloudy before molting ⇒ vision impaired for a time
- can turn in their sockets
- have a moveable lens ⇒ focuses the eye sharply
  - especially at close range
- pupils shaped differently in different snakes
  - round pupils
    - snakes active in daytime
  - elliptical pupils ≈ cat's eyes
    - snakes active at night

Ears
- embedded in skull
- no external openings ⇒ snakes don't hear vibrations
  - carried by air
- instead ✱
- skull bones carry vibrations
  - go to ear mechanisms
    - highly sensitive

#103: STRUCTURES OF A SNAKE'S HEAD

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	0	1
1.	1.3	structures of a snake's head	EXAMP	mouth
		1	1	1
2.	2.2	mouth	PROP	large
		1	1	0
3.	2.2	mouth	PROP	has jaws
		0	1	1
4.	2.22	jaws	PROP	have teeth
		1	0	1
5.	2.223	have teeth	EXAMP	upper jaw
		1	1	1
6.	2.2232	upper jaw	PROP	double row of teeth
		1	0	1
7.	2.223	have teeth	EXAMP	lower jaw
		1	1	1
8.	2.2232	lower jaw	PROP	single row of teeth
		1	1	1
9.	2.222	have teeth	PROP	cone-shaped
		1	1	1
10.	2.222	have teeth	PROP	slant back toward the throat
		1	1	1
11.	2.222	have teeth	PROP	not used for chewing
		1	1	1
12.	2.222	have teeth	PROP	necessary to hold prey
		1	1	1
13.	2.2225	not used for chewing	NOT SIM	necessary to hold prey
		1	1	1
14.	2.2222	prey	PROP	swallowed whole
		1	0	1
15.	1.3	structures of a snake's head	EXAMP	nasal cavities

#103: STRUCTURES OF A SNAKE'S HEAD

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
16.	3.2	1 nasal cavities	1 PROP	1 contain olfactory nerve endings
17.	3.2	1 nasal cavities	1 PROP	1 open as paired nostrils
18.	3.22	1 paired nostrils	1 PROP	1 near the front of the head
19.	3.2	1 nasal cavities	0 PROP	1 sense of smell
20.	3.22	1 sense of smell	1 PROP	1 very acute
21.	3.22	1 sense of smell	1 PROP	1 aided by forked tongue
22.	3.222	1 forked tongue	1 PROP	1 rests in a sheath
23.	3.2222	1 rests in a sheath	1 PROP	1 on the floor of the mouth
24.	3.222	1 forked tongue	1 PROP	1 flicks out through small opening
25.	3.2222	1 small opening	1 PROP	1 opening is left when jaws are closed
26.	3.222	1 forked tongue	1 PROP	1 picks up dust
27.	3.222	1 forked tongue	1 PROP	1 picks up odor-bearing particles from air
28.	3.2226	1 picks up dust and odor-bearing particles from air	0 PREC	1 transfers them to Jacobson's organ
29.	3.22261	1 Jacobson's organs	1 DEP	1 tiny pits in front of the roof of the mouth
30.	3.22262	1 Jacobson's organs	1 PROP	1 contain nerve endings

#103: STRUCTURES OF A SNAKE'S HEAD

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
31.	3.222622	contain nerve endings	PROP	sensitive to odors
		1	0	1
32.	1.3	structures of a snake's head	EXAMP	eyes of snakes
		1	1	1
33.	4.2	eyes of snakes	PROP	no lids
		1	1	1
34.	4.2	eyes of snakes	PROP	each covered by a transparent scale
		1	1	1
35.	4.22	each covered by a transparent scale	PROP	become cloudy before moulting
		1	1	1
36.	4.227	becomes cloudy before moulting	CAUS	vision impaired for a time
		1	1	1
37.	4.25	(eyes of snake) have no lids	NOT SIM	other reptiles' eyes
		1	1	1
38.	4.25	each covered by a transparent scale	NOT SIM	other reptiles' eyes
		1	1	1
39.	4.2	eyes of snakes	PROP	can turn in their sockets
		1	1	1
40.	4.2	eyes of snakes	PROP	a moveable lens focuses the eye sharply
		1	0	1
41.	4.27	have a moveable lens	CAUS	focuses the eye sharply
		1	1	1
42.	4.272	focuses the eye sharply	PROP	especially at close range
		1	1	1
43.	4.2	eyes of snakes	PROP	pupils shaped differently in different snakes
		1	0	1
44.	4.23	pupils shaped differently in different snakes	EXAMP	round pupils

#103: STRUCTURES OF A SNAKE'S HEAD

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
45.	4.232	round pupils	PROP	snakes active in daytime
		1	0	1
46.	4.23	pupils shaped differently in different snakes	EXAMP	elliptical pupils
		1	1	1
47.	4.234	elliptical pupils	SIM	cat's eyes
		1	1	1
48.	4.232	elliptical pupils	PROP	snakes active at night
		1	0	1
49.	1.3	structure of snake's head	EXAMP	ears
		1	1	1
50.	5.2	ears	PROP	embedded in skull
		1	0	1
51.	5.2	ears	PROP	have no external openings
		1	1	1
52.	5.27	no external openings	CAUS	snakes don't hear vibrations
		1	1	1
53.	5.272	vibrations	PROP	carried by air
		1	1	1
54.	5.2	ears	PROP	skull bones carry vibrations
		1	1	1
55.	5.275	There are no external openings. Thus, the snake cannot hear vibrations carried by air.	NOT SIM	skull bones carry vibrations
		1	1	1
56.	5.22	vibrations	PROP	go to ear mechanisms
		1	1	1
57.	5.222	ear mechanisms	PROP	highly sensitive
		1	1	1
58.	4.25	no lids	NOT SIM	each covered by transparent scale

#104--Reproductive System of the Frog

The Reproductive System

In both sexes, the frog's sex organs are internal. Thus, it is hard to tell the sexes apart, except during the breeding season. At this time, the thumbs of the males are enlarged.

The male reproductive organs are two oval testes. The testes are a creamy-white or yellow color. They lie in the back, one of each side of the spine, in the anterior region of the kidneys. Sperm cells develop in the testes. The sperms then pass through tubes, the vasa efferentia, into the kidneys. When the sperms are discharged, they pass through the ureters into the cloaca. Some frog species have an enlargement, the seminal vesicle, at the base of each ureter.

In the female frog, the eggs develop in a pair of large lobed ovaries. The ovaries lie along the back above the kidneys. During the breeding season, the eggs enlarge and burst through the thin ovary walls. This frees the eggs into the body cavity. The abdominal muscles work the eggs toward the anterior. Here funnel-like openings to the oviducts gather the eggs. Oviducts are long and coiled, and are lined with ciliated cells. The cilia fan the eggs into the oviduct openings. Oviducts lead into the cloaca. Near the openings to the cloaca, the walls of the oviduct secrete a jellylike substance. This substance surrounds each egg. There is a saclike uterus at the base of each oviduct. The eggs are stored in the uterus until they are laid.

# 104--REPRODUCTIVE SYSTEM OF THE FROG

Sex organs of both sexes

- are internal → hard to tell apart
  - except during breeding season
    - thumbs of the males are enlarged

Male reproductive system

- involves testes
  - DEF: male reproductive organs
  - two
  - oval
  - creamy white or yellow color
  - lie in the back
    - one on each side
    - in the anterior region of the kidneys
  - sperm cell develop in them

→ sperms pass through vasa efferentia
- DEF: tubes that connect testes to kidneys

→ sperms go into kidneys

→ sperms are discharged
- pass through uretars
  - some frog species have seminal vesicles
    - DEF: enlargements at the base of each uretar
- sperms go into cloaco

Female reproductive system

- involves ovaries
  - eggs develop there
  - large
  - lobed
  - lie along the back
    - above the kidneys

(activities) during the breeding season

eggs enlarge → eggs burst through thin ovary walls → eggs freed into the body cavity → abdominal muscles work the eggs toward the anterior

→ eggs are gathered
- eggs get fanned
  - by cilia
  - into oviduct opening
    - funnel-like

→ eggs go into oviduct
- long
- coiled
- lined with ciliated cells
- leads into the cloaca
- has walls
  - thin
  - secrete substance
    - near opening to cloaca
    - jelly-like
    - surrounds each egg

→ eggs go into cloaca

→ eggs stored
- in uterus
  - sac-like
  - located at base of oviduct

→ (until) eggs are laid

#104: REPRODUCTIVE SYSTEM OF THE FROG

#	embed-dedness		CONCEPT A		RELATION-SHIP		CONCEPT B
1.	1.2	1	reproductive system of the frog	0	PROP	1	sex organs of both sexes
2.	1.22	1	sex organs of both sexes	1	PROP	1	are internal
3.	1.22	1	sex organs of both sexes	1	PROP	1	hard to tell apart
4.	1.227	1	are internal	1	CAUS	1	hard to tell apart
5.	1.222	1	hard to tell apart	1	PROP	1	except during breeding season
6.	1.2222	1	except during breeding season	1	PROP	1	thumbs of the males are enlarged
7.	1.3	1	reproductive system of the frog	0	EXAMP	0	male reproductive system
8.	2.2	0	male reproductive system	1	PROP	1	involves testes
9.	2.21	1	involves testes	0	DEF	1	male reproductive organs
10.	2.22	1	testes	1	PROP	1	two
11.	2.22	1	testes	1	PROP	1	oval
12.	2.22	1	testes	1	PROP	1	creamy-white or yellow color
13.	2.22	1	testes	1	PROP	1	lie in the back
14.		1	testes	1	PROP	1	one on each side of spine
15.	2.22	1	testes	1	PROP	1	in the anterior region of the kidneys

#104: REPRODUCTIVE SYSTEM OF THE FROG

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
16.	2.22	testes	PROP	sperm cells develop in them
		1	1	1
17.	2.226	sperm cells develop in them	PRED	sperms pass through vasa efferentia
		1	0	0
18.	2.2261	vasa efferentia	DEF	tubes that connect testes to kidneys
		1	1	1
19.	2.2266	sperms pass through vasa efferentia	PREC	sperms go into kidneys
		1	0	1
20.	2.22666	sperms go into kidneys	PREC	sperms are discharged
		1	1	1
21.	2.226662	sperms are discharged	PROP	pass through ureters
		1	0	1
22.	2.2266622	pass through ureters	PROP	some frog species have seminal vesicles
		1	1	1
23.	2.22666221	seminal vesicles	DEF	enlargements at base of each ureter
		1	1	1
24.	2.226662	sperms are discharged	PROP	sperms go into cloaca
		1	1	1
25.	2.2166626	pass through ureters	PREC	sperms into cloaca
		0	1	1
26.	2.2	male reproductive system	PROP	REL. PROP. #16,17,19,28,25
		1	0	1
27.	1.3	reproductive system of the frog	EXAMP	female reproductive system
		0	1	1
28.	3.2	female reproductive system	PROP	involves ovaries
		1	1	1
29.	3.22	ovaries	PROP	eggs develop there

#104: REPRODUCTIVE SYSTEM OF THE FROG

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
30.	3.22	ovaries	PROP	large
		1	1	1
31.	3.22	ovaries	PROP	lobed
		1	1	1
32.	3.22	ovaries	PROP	lie along the back
		1	1	1
33.	3.22	ovaries	PROP	above the kidneys
		0	0	0
34.	3.2	female reproductive system	PROP	activities during the breeding season
		0	1	1
35.	4.2	(activities) during the breeding season	PROP	Rel. Prop.# 35,36,37,38,42,54
		1	0	1
36.	4.26	eggs enlarge	PREC	eggs burst through thin ovary walls
		1	0	1
37.	4.266	eggs burst through thin ovary walls	PREC	eggs freed into the body cavity
		1	0	1
38.	4.2666	eggs freed into the body cavity	PREC	abdominal muscles work the eggs toward the anterior
		1	0	1
39.	4.26666	abdominal muscles work the eggs toward the anterior	PREC	eggs are gathered
		1	0	1
40.	4.266662	eggs are gathered	PROP	eggs get fanned
		1	1	1
41.	4.2666622	eggs get fanned	PROP	by cilia
		1	1	1
42.	4.2666622	eggs get fanned	PROP	into oviduct opening
		1	1	1
43.	4.26666222	oviduct opening	PROP	funnel-like

104: REPRODUCTIVE SYSTEM OF THE FROG

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
44.	4.266666	1 eggs are gathered	0 PREC	0 (eggs go into oviduct)
45.	4.2666662	1 oviduct	1 PROP	1 long
46.	4.2666662	1 oviduct	1 PROP	1 coiled
47.	4.2666662	1 oviduct	1 PROP	1 lined with ciliated cells
48.	4.2666662	1 oviduct	1 PROP	1 leads into the cloaca
49.	4.2666662	1 oviduct	1 PROP	1 has walls
50.	4.26666622	1 has walls	1 PROP	1 secreted substance
51.	4.266666222	1 secrete substance	1 PROP	1 near opening to cloaca
52.	4.266666222	1 secrete substance	1 PROP	1 jelly-like
53.	4.266666222	1 secrete substance	1 PROP	1 surrounds each egg
54.	4.2666666	0 (eggs go into oviduct)	0 PREC	0 (eggs go into cloaca)
55.	4.26666666	0 (eggs go into the cloaca)	0 PREC	1 eggs stored
56.	4.266666662	1 eggs stored	1 PROP	1 in uterus
57.	4.2666666622	0 uterus	1 PROP	1 saclike
58.	4.2666666622	1 uterus	1 PROP	1 located at base of oviduct
59.	4.266666664	1 eggs stored	1 PREC	1 eggs are laid

#105--Muscle Structure

Muscle Structure

Striated muscle makes up about 40 percent of the weight of the body. It is the most common single type of tissue. As was pointed out in Chapter 4, striated muscle tissue is composed of elongated, highly specialized cells, the muscle fibers. Each fiber is apparently crossed by numerous alternately light and dark bands, the striations. Under the ordinary light microscope, these bands appear to be continuous from one side of the fiber to the other. With the aid of an electron microscope, the bands are seen to be features of the extremely small myofibrils which are very closely packed together and run lengthwise through the fiber. As shown in Fig. 6-1, each fiber is surrounded by a thin layer of connective tissue, the sarcolemma.

When an exceptionally well-prepared section of striated muscle tissue is viewed with a light microscope, a series of dark bands are seen. These are called the A bands, and in the middle of each is found a narrow light area, the II band. On either side of the A band is another light area knows as the I band which is crossed by a very thin line of darker material, the Z band. The material lying between the two Z bands makes up what is now considered to be the unit of structure of a muscle fiber, the sarcomere. The banding of the myofibril is determined by the distribution of the materials composing it.

105--MUSCLE STRUCTURE

- Contained in striated muscles
  - make up about 40% of body weight
  - most common type of tissue
  - composed of muscle fibers
    - elongated cells
    - highly specialized cells
    - surrounded by sarcolemma
      - DEF: thin layer of connective tissue
  - crossed by striations
    - DEF: alternately light and dark bands
    - can be used under a light microscope
      - an exceptionally well-prepared section must be used
      - appear to be continuous bands from one side of fiber to the other
        - called A bands
          - dark
          - has II Bands in the middle
            - light
            - narrow
          - has I Bands on either side
            - light
            - crossed by Z Bands
              - dark
    - can be seen under an electron microscope
      - seen as features myofibrils
        - extremely small
        - very closely packed together
        - run lengthwise through fiber
        - are banded
          - determined by distribution of materials composing it
  - composed of sarcomeres
    - all material between Z Bands
    - structural unit of muscle fiber

#105: MUSCLE STRUCTURE

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	0	1
1.	1.2	Muscle structure	PROP	contained in striated muscle
		1	1	1
2.	2.2	striated muscles	PROP	make up about 40% of body weight
		1	1	1
3.	2.2	striated muscles	PROP	most common type of tissue
		1	1	1
4.	2.2	striated muscles	PROP	composed of muscle fibers
		1	1	1
5.	2.22	muscle fibers	PROP	elongated cells
		1	1	1
6.	2.22	muscle fibers	PROP	highly specialized cells
		1	1	1
7.	2.22	muscle fibers	PROP	surrounded by sarcolemma
		1	1	1
8.	2.221	sarcolemma	DEF	thin layer of connective tissues
		1	0	1
9.	2.2	striated muscles	PROP	crossed by striations
		1	1	1
10.	2.21	striations	DEP	alternately light and dark bands
		1	1	1
11.	2.22	striations	PROP	can be seen under ordinary light microscope
		1	1	1
12.	2.222	can be seen under ordinary light microscope	PROP	an exceptionally well-prepared sample must be used
		1	1	1
13.	2.222	seen under ordinary light microscope	PROP	appear to be continuous bands from one side of fiber to the other
		1	1	1
14.	2.22	striations	PROP	can be seen under the electron microscope
		1	1	1
15.	2.222	seen under electron microscope	PROP	seen as features of myofibrils

#105: MUSCLE STRUCTURE

#	embeddedness	CONCEPT A	RELATIONSHIP	CONCEPT B
		1	0	1
16.	2.2225	seen under the ordinary microscope	NOT SIM	seen under the electron microscope
		1	0	1
17.	2.2225	appearing to be continuous bands from one side of fiber to other	NOT SIM	being seen as features of myofibrils
		1	0	1
18.	2.2222	appear to be continuous bands from one side of fiber to the other	PROP	A bands
		1	1	1
19.	2.22222	A Bands	PROP	dark
		1	1	1
20.	2.22222	A Bands	PROP	have II Bands in the middle
		1	1	1
21.	2.222222	II Bands	PROP	light
		1	1	1
22.	2.222222	II Bands	PROP	narrow
		1	1	1
23.	2.22222	A Bands	PROP	have I Bands on either side
		1	1	1
24.	2.222222	I Bands	PROP	light
		1	1	1
25.	2.222222	I Bands	PROP	crossed by Z Band
		1	1	1
26.	2.2222222	I Bands	PROP	dark
		1	1	1
27.	2.2222	seen as features of myofibers	PROP	extremely small
		1	1	1
28.	2.2222	seen as features of myofibrils	PROP	very closely packed together

105: MUSCLE STRUCTURE:

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
29.	2.2222	seen as features of myofibrils	PROP	run lengthwise through fiber
		1	1	1
30.	2.2222	seen as features of myofibrils	PROP	are banded
		1	1	1
31.	2.22222	banded	PROP	determined by distribution of materials composing it
		1	0	1
32.	2.2	striated muscles	PROP	composed of sarcomeres
		1	1	1
33.	2.22	sarcomeres	PROP	all material between two Z Bands
		1	1	1
34.	2.22	sarcomeres	PTOP	structural unit of muscle fiber

#106--How Muscles Work

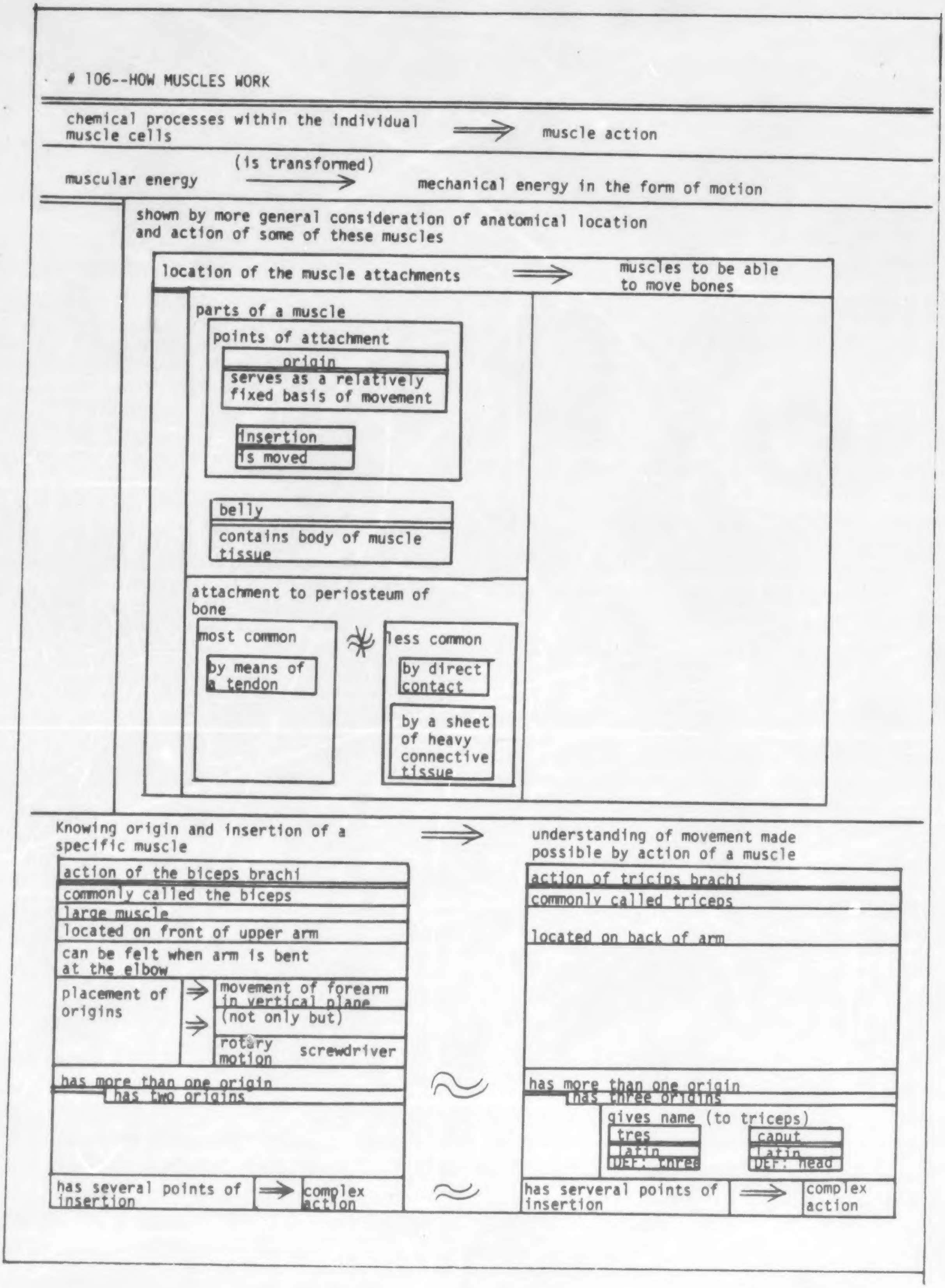
(no heading)

We have seen that muscle action is the result of chemical processes within the individual muscle cells. A more general consideration of the anatomical location and action of some of these muscles will show how this muscular energy is transformed into mechanical energy in the form of motion.

Muscles are able to move bones because of the location of the muscle attachments. These points of attachment are called the origin and the insertion. The attachment to the bone that serves as a relatively fixed basis of movement is the origin. The insertion is the point of attachment to the bone which is moved. Most muscles are attached to the periosteum of a bone by means of a tendon; however, some make direct contact with the periosteum, while others are attached by a sheet of heavy connective tissue. The belly of the muscles contains the body of the muscle tissue itself. To understand the movement made possible by the action of a specific muscle, it is necessary to know its origin and insertion.

Consider, for example, the action of the biceps brachii, commonly called, the biceps. This is a large muscle on the front of the upper arm that can be felt when the arm is bent at the elbow. Because of the placement of its origins, it not only brings about a movement of the forearm in a vertical plane, but also gives it a rotary motion, such as that used with a screwdriver. In Fig. 7-1 we can see that both the biceps and the triceps brachii or triceps (on the back of the arm) have more than one origin each: the triceps has three points of origin and derives its name from that fact (Latin, tres, three + caput, head), and the biceps has two. It will be noted that these muscles have several points of insertion, and because of this, complex action is possible.

# 106--HOW MUSCLES WORK



chemical processes within the individual muscle cells ⟹ muscle action

muscular energy → (is transformed) → mechanical energy in the form of motion

shown by more general consideration of anatomical location and action of some of these muscles

location of the muscle attachments ⟹ muscles to be able to move bones

parts of a muscle

points of attachment

- origin
  - serves as a relatively fixed basis of movement
- insertion
  - is moved

belly

- contains body of muscle tissue

attachment to periosteum of bone

- most common
  - by means of a tendon
- less common
  - by direct contact
  - by a sheet of heavy connective tissue

Knowing origin and insertion of a specific muscle ⟹ understanding of movement made possible by action of a muscle

action of the biceps brachi

- commonly called the biceps
- large muscle
- located on front of upper arm
- can be felt when arm is bent at the elbow
- placement of origins → movement of forearm in vertical plane → (not only but) rotary motion screwdriver
- has more than one origin
  - has two origins
- has several points of insertion → complex action

action of tricips brachi

- commonly called triceps
- located on back of arm
- has more than one origin
  - has three origins
    - gives name (to triceps)
      - tres / latin / DEF: three
      - caput / latin / DEF: head
- has serveral points of insertion → complex action

#106: HOW MUSCLES WORK

#	embeddedness	CONCEPT A	RELATIONSHIP	CONCEPT B
1.	1.2	0 how muscles work	1 PROP	1 Rel. Prop. #2
2.	1.27	1 chemical processes within individual muscle cells	1 CAUS	1 muscle action
3.	1.2	0 how muscles work	1 PROP	1 Rel. Prop. #4
4.	1.27	1 muscular energy	1 CAUS	1 mechanical energy in the form of motion
5.	1.272	1 Rel. Prop. #4	1 PROP	1 shown by more general consideration of anatomical location and action of some of these muscles
6.	2.3	1 shown by more general consideration of anatomical location and action of some of these muscles	0 EXAMP	1 Rel. Prop. #7
7.	2.37	1 anatomical location of the muscle attachment	1 CAUS	1 muscles to be able to move bones
8.	2.32	1 anatomical location of the muscle attachment	0 PROP	0 parts of a muscle
9.	2.323	0 parts of a muscle	0 EXAMP	1 points of attachment
10.	2.3233	1 points of attachment	1 EXAMP	1 origin
11.	2.32332	1 origin	1 PROP	1 serves as a relatively fixed basis of movement
12.	2.3233	1 points of attachment	1 EXAMP	1 belly
13.	2.32332	1 insertion	1 PROP	1 is moved

#106: HOW MUSCLES WORK

#	embed-dedness	CONCEPT A			RELATION-SHIP		CONCEPT B
14.	2.3233	parts of a muscle	0	0	EXAMP	1	belly
15.	2.32332	belly	1	1	PROP	1	contains body of muscle tissue itself
16.	2.32	anatomical location of the muscle attachment	1	0	PROP	1	attachment to the periosteum of a bone
17.	2.323	attachment to periosteum of a bone	1	0	EXAMP	1	most common
18.	2.3233	most common	1	0	EXAMP	1	by means of a tendon
19.	2.323	attachment to periosteum of a bone	1	0	EXAMP	1	less common
20.	2.3233	less common	1	0	EXAMP	1	by direct contact
21.	2.3233	less common	1	0	EXAMP	1	by a sheet of heavy connective tissue
22.	2.3235	most common	1	1	NOT SIM	1	less common
23.	1.2	how muscles work	0	1	PROP	1	Rel. PROP. #24
24.	3.7	knowing the origin and insertion of a specific muscle	1	1	CAUS	1	understanding of movement made possible by action of muscle
25.	3.73	Rel. Prop. #24	1	1	EXAMP	1	action of bicep brachii
26.	3.732	biceps brachii	1	1	PROP	1	commonly called biceps
27.	3.732	biceps brachii	1	1	PROP	1	large muscle

#106: HOW MUSCLES WORK

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
28.	3.732	1 biceps brachii	1 PROP	1 located on front of upper arm
29.	3.732	1 biceps brachii	1 PROP	1 can be felt when arm is bent at the elbow
30.	3.732	1 biceps brachii	1 PROP	1 Rel. Prop. #32
31.	3.732	1 biceps brachii	1 PROP	1 Rel. Prop. #33
32.	3.7327	1 placement of origins	1 CAUS	1 movement of forearm in vertical plane
33.	3.7327	1 placement of origins	1 CAUS	1 rotary motion
34.	3.73274	1 rotary motion	1 NOT SIM	1 screwdriver
35.	3.73275	1 movement of forearm in vertical plane	1 NOT SIM	1 rotary motion
36.	3.732	1 biceps brachii	1 PROP	1 has more than one origin
37.	3.7322	1 more than one origin	1 PROP	1 has two origins
38.	3.732	1 biceps brachii	1 PROP	1 has several points of insertion causes complex action
39.	3.7327	1 has several points of insertion	1 CAUS	1 complex action
40.	3.73	1 Rel. Prop. #24	0 EXAMP	1 action of triceps brachii
41.	3.732	1 triceps brachii	1 PROP	1 commonly called triceps
42.	3.732	1 triceps brachii	1 PROP	1 located on back of the arm

#106: HOW MUSCLES WORK

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
43.	3.732	triceps brachii	PROP	has more than one origin
		1	1	1
44.	3.7322	more than one origin	PROP	has three origins
		1	1	1
45.	3.73222	has three origins	PROP	gives name (to triceps)
		1	1	1
46.	3.732223	its name	EXAMP	tres
		1	1	1
47.	3.7322232	tres	PROP	Latin
		1	1	1
48.	3.7322231	tres	DEF	three
		1	1	1
49.	3.732223	its name	EXAMP	caput
		1	1	1
50.	3.7322232	caput	PROP	Latin
		1	1	1
51.	3.7322231	caput	DEF	head
		1	1	1
52.	3.732	triceps brachii	PROP	Rel. Prop. #53
		1	1	1
53.	3.7327	has several points of insertion	CAUS	complex action
		1	1	1
54.	3.7324	Rel. Prop. #36	SIM	Rel. Prop. #43
		1	1	1
55.	3.73274	Rel. Prop. #39	SIM	Rel. Prop. #53

#107 Skeletal Muscles Work in Pairs

(no heading)

The action of the biceps and the triceps when the arm is flexed or extended at the elbow illustrates an important characteristic of muscles: most skeletal muscles work in pairs. For each muscular contraction that brings about motion in one direction, there is possible a motion in the opposite direction which depends upon the contraction of the other member of the muscle pair. For example, when you flex your arm, the action is largely the result of the contraction of the biceps muscle. But when you extend your arm, the triceps muscle contracts. These opposing actions are brought about by the so-called antagonistic muscles.

The contraction of pairs of antagonistic muscles is controlled by the central nervous system. Although the exact mechanism is not clearly understood, it appears that the contraction of a muscle stimulates nerve cells that lie within it. These nerve cells, known as stretch receptors, send a volley of nervous impulses to the central nervous sustem--to either the brain or the spinal cord. A nervous impulse prevents the muscle from contracting rather than causing it to relax. The resulting smooth action of antagonistic muscles is due to this condition known as reciprocal innervation.

# 107--SKELETAL MUSCLES WORK IN PAIRS

important characteristic of muscles

involves antagonistic muscles ⟹ opposing actions

for each muscular contraction

⇓

motion in one direction

→

muscle contraction of other member of pair

⇓

motion in opposite direction

action of the biceps and triceps

contraction of biceps muscle

⇓

arm is flexed at elbow

(but when)

triceps muscle contracts

⇓

arm is extended at elbow

contraction of antagonistic muscle is controlled by the central nervous system

exact mechanism is not clearly understood

(although)

appears that contraction of a muscle ⟹ stimulates nerve cells

lie within the muscle

DEF: stretch receptors

→ send a volley of nervous impulses

to the central nervous system

either the brain

or the spinal column

nervous impulse prevents the muscle from contracting (rather than) causing it(muscle to relax

DEF: reciprocal innervation

⇓

resulting smooth action of antagonistic muscles

#107: THE ACTION OF THE BICEPS AND TRICEPS

#	embeddedness	CONCEPT A	RELATIONSHIP	CONCEPT B
1.	1.2	1 skeletal muscles work in pairs	1 PROP	1 important characteristic of muscles
2.	1.2	1 skeletal muscles work in pairs	0 PROP	1 Rel. Prop. #3
3.	1.27	1 antagonistic muscles	1 CAUS	1 opposing actions
4.	1.222	1 antagonistic muscles cause opposing actions	1 PROP	1 Rel. Prop. #5,6,7
5.	1.2727	1 for each muscular contraction	1 CAUS	1 motion in one direction
6.	1.2727	1 muscle contraction of other member of pair	1 CAUS	1 motion in opposite direction
7.	1.2726	1 Rel. Prop. #5	0 PREC	1 Rel. Prop. #6
8.	1.2723	1 Rel. Prop. #5,6,7	1 EXAMP	0 action of the biceps and triceps
9.	1.27233	0 action of the biceps and triceps	0 EXAMP	1 contraction of the biceps muscle
10.	1.27233	0 action of the biceps and triceps	0 EXAMP	1 triceps muscle contracts
11.	1.272335	1 contraction of the biceps muscle	1 NOT SIM	1 triceps muscle contracts
12.	1.272337	1 contraction of the biceps muscle	1 CAUS	1 the arm is flexed at the elbow
13.	1.272337	1 triceps muscle contracts	1 CAUS	1 the arm is extended at the elbow
14.	1.272	1 antagonistic muscles cause opposing actions	1 PROP	1 contraction of antagonistic muscle controlled by central nervous system

#107: THE ACTION OF THE BICEPS AND TRICEPS

#	embeddedness	CONCEPT A	RELATIONSHIP	CONCEPT B
15.	2.2	1 contraction of antagonistic muscle controlled by central nervous system	1 PROP	1 exact mechanism is not clearly understood
16.	2.25	1 exact mechanism is not clearly understood	1 NOT SIM	1 Rel. Prop. #18, 19
17.	2.2	1 contraction of antagonistic muscle controlled by central nervous system	0 PROP	1 Rel. Prop. #18,19
18.	2.27	1 appears that a contraction of a muscle	1 CAUS	1 stimulates nerve cells
19.	2.276	1 stimulates nerve cells	1 PREC	1 send a volley of nervous impulses
20.	2.272	1 nerve cells	1 PROP	1 lie within the muscle
21.	2.271	1 nerve cells	1 DEF	1 stretch receptors
22.	2.2762	1 send a volley of nervous impulses	1 PROP	1 to the central nervous system
23.	2.27623	1 central nervous system	1 EXAMP	1 either the brain
24.	2.27623	1 central nervous system	1 EXAMP	1 or the spinal cord
25.	2.2762	1 send a volley of nervous impulses	0 PROP	1 Rel. Prop. #26
26.	2.27625	1 nervous impulse prevents the muscle from contracting	1 NOT SIM	1 causing the muscle to relax
27.	2.27621	1 Rel. Prop. #26	1 DEF	1 reciprocal innervation

#107: THE ACTION OF THE BICEPS AND TRICEPS

#	embed- dedness	CONCEPT A	RELATION- SHIP	CONCEPT B
	1		1	1
28.	2.276217	reciprocal innervation	CAUS	resulting smooth action of antagonistic muscles.

#108 Muscles in the leg (below the knee)

(no heading)

In the leg (below the knee) are two muscles that form the calf of the leg, the more prominent being the gastrocnemius. It has its origins on the base of the femur, with its insertion in the heel bone (calcancus) by means of the heavy Achilles' tendon. Closely associated with the gastrocnemius is the soleus. This originates on the upper surfaces of the tibia and fibula and its tendon blends with that of the gastrocnemius. The action of both of these muscles is to point the foot downward, and their general form and course can be noted with each step as the heel is raised form the floor in walking.

The front of the leg is characterized by a complex group of muscles, some of which are quite conspicuous in their action, while others show merely as rippling motions under the skin. There is one muscle of special interest because of its ability to flex the foot strongly at the ankle. This is the tibialis anterior which lies just outside of (lateral to) the shin bone. The origin of this muscle is on the front of the tibia and its insertion is on one of the tarsal bones. As a result of its contraction, the foot is drawn upward, allowing the weight of the body to fall on the heel. The tibialis anterior is frequently affected by the type of poliomyclitis that injures the nerves controlling the muscles which are situated in the front of the legs.

# 108--MUSCLES IN THE LEG (BELOW THE KNEE)

two muscles form the calf of the leg

- gastrocnemius
  - more prominent
  - has origins
    - on base of femur
  - has insertion
    - in heel base
      - called calcaneus
    - by means of Achilles Tendon
      - heavy

≈

- soleus
  - closely associated with gastrocnemius
  - has origins
    - on upper surfaces of tibia and fibula
  - has insertion
    - tendon blends with that of gastrocnemius

- action of both is to point the foot downward
- their general form and cause can be noted with each step
  - as heel is raised from the floor in walking

has complex group of muscles in the front of the leg

- some are quite conspicuous in their action

  (while) ≉

- others show merely as rippling motions under the skin

- tibialis anterior
  - has ability to flex foot strongly at the ankle ⇒ especial interest
  - lies just outside of the shin bone — lateral to the shin bone
  - has origin
    - on front of tibia
  - has insertion
    - on one of the tarsel bones
  - its contraction ⇒ foot to be drawn upward → weight of body to fall on the heel
  - frequently affected by a type of poliomyelitis
    - injures the nerves controlling the muscles
      - situated in the front of the legs

#108: IN THE LEG BELOW THE KNEE

#	embeddedness		CONCEPT A		RELATIONSHIP		CONCEPT B
1.	1.2	0	muscles in the leg (below the knee)	1	PROP	1	two muscles form the calf of the leg
2.	1.23	1	two muscles form the calf of the leg	1	EXAMP	1	gastroenemius
3.	1.23	1	two muscles form the calf of the leg	0	EXAMP	1	soleus
4.	1.234	1	gastroenemius	0	SIM	1	soleus
5.	1.232	1	gastroenemius	1	PROP	1	more prominent
6.	1.232	1	gastroenemius	1	PROP	1	has origin
7.	1.2322	1	has origin	1	PROP	1	on base of femur
8.	1.232	1	gastroenemius	1	PROP	1	has insertion
9.	1.2322	1	has insertion	1	PROP	1	in heel bone
10.	1.23222	1	heel bone	0	PROP	1	called calcaneus
11.	1.2322	1	has insertion	1	PROP	1	be means of Achilles Tendon
12.	1.23222	1	Achilles Tendon	1	PROP	1	heavy
13.	1.232	1	soleus	1	PROP	1	closely associated with gastroenemius
14.	1.232	1	soleus	1	PROP	0	has origin
15.	1.2322	0	has origin	1	PROP	1	on upper surfaces of tibia and fibula

#108: IN THE LEG BELOW THE KNEE

#	embed-dedness		CONCEPT A		RELATION-SHIP		CONCEPT B
16.	1.232	1	soleus	1	PROP	0	has insertion
17.		0	has insertion	0	PROP	1	tendon blends with that of gastroenemius
18.	1.22	1	two muscles form the calf of the leg	1	PROP	1	action of both is to point the foot downward
19.	1.22	1	two muscles form the calf of the leg	1	PROP	1	general form and course can be noted with each step
20.	1.222	1	each step	1	PROP	1	as heel is raised from the floor in walking
21.	1.2	0	muscles in the leg (below the knee)	1	PROP	1	has complex groups of muscles in the front of the leg
22.	2.2	1	complex group of muscles in the front of the leg	1	PROP	1	some are quite conspicuous in their action
23.	2.2	1	complex groups of muscles in the front of the leg	1	PROP	1	others show merely as rippling motions under the skin
24.	2.25	1	some are quite conspicuous in their action	1	NOT SIM	1	others show merely as rippling motions under the skin
25.	2.3	1	has complex group of muscles in the front of the leg	0	EXAMP	1	tibialis anterior
26.	2.32	1	tibialis anterior	1	PROP	1	has ability to flex the foot strongly at the ankle
27.	2.32	1	tibialis anterior	1	PROP	1	of especial interest
28.	2.37	1	has ability to flex the foot strongly at the ankle	1	CAUS	1	of especial interest

#108: IN THE LEG BELOW THE KNEE

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	
29.	2.32	tibialis anterior	PROP	lies just outside of the shin bone
		1	0	1
30.	2.324	lies just outside of the shin bone	SIM	lateral to the shin bone
		1	1	1
31.	2.2	tibialis anterior	PROP	has origin
		1	1	1
32.	2.22	has origin	PROP	on front of tibia
		1	1	1
33.	2.2	tibialis anterior	PROP	has insertion
		1	1	1
34.	2.22	has insertion	PROP	on one of the tarsel bones
		1	1	1
35.	2.2	tibialis anterior	PROP	Rel. Prop. #36,37
		1	1	1
36.	2.27	its contraction	CAUS	foot to be drawn upward
		1	0	1
37.	2.276	foot to be drawn upward	PREC	weight of body to fall on the heel
		1	1	1
38.	2.2	tibialis anterior	PROP	frequently affected by the type of poliomyelitis
		1	1	1
39.	2.22	type of poliomyelitis	PROP	injures the nerves controlling the muscles
		1	1	1
40.	2.222	muscles	PROP	situated in the front of the legs

#109 The Phylum Chordata

Chordates--The Most Complex Form of Animal Life

The phylum Chordata contains the most complex animals that have ever lived on this earth. This phylum has four subphyla. The largest and most important subphylum is the Vertebrata. This subphylum includes fish, amphibians, reptiles, birds, and mammals.

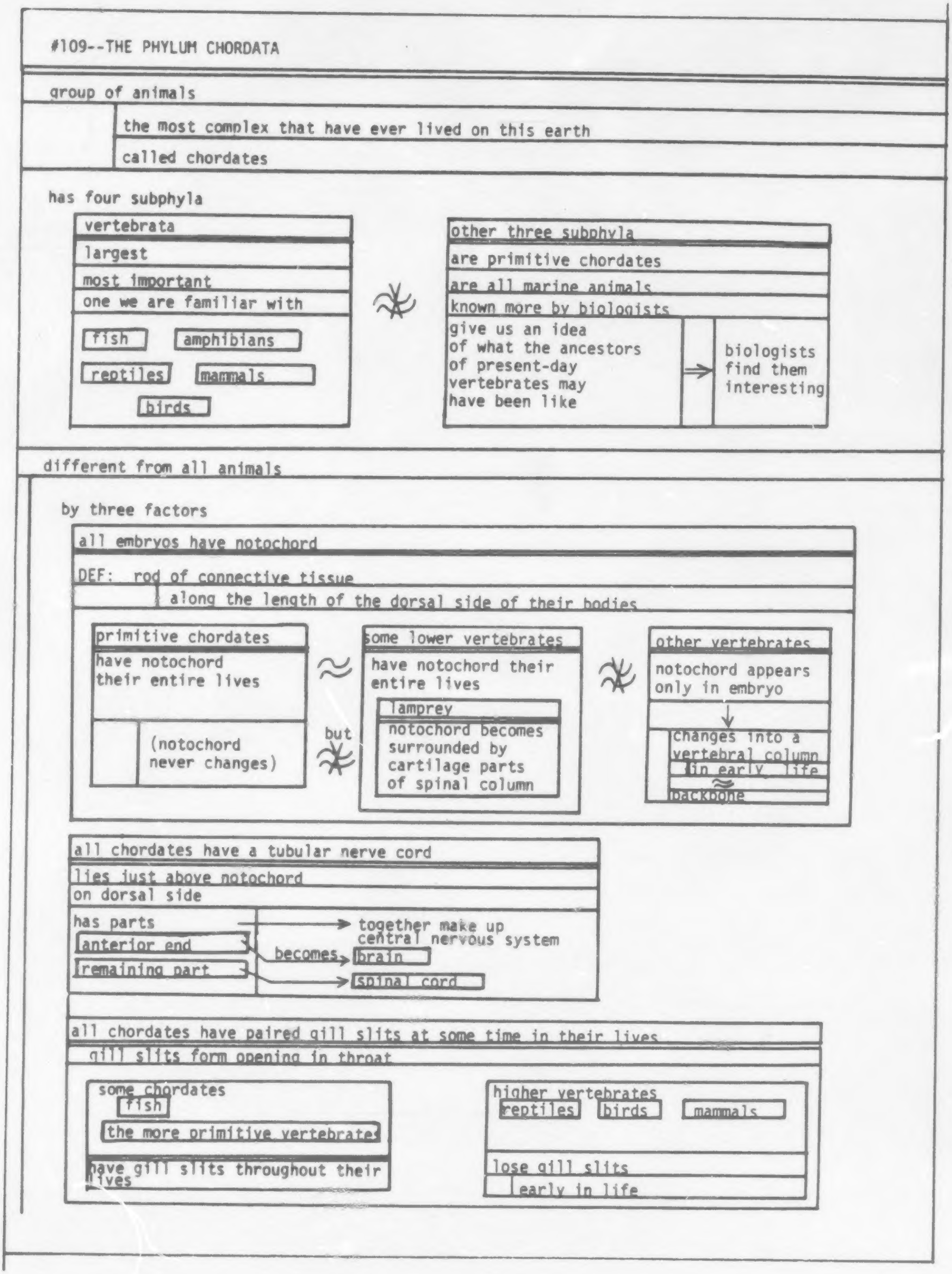
Three factors make chordates different from all other animals.

- All chordate embryos have a rod of connective tissue along the length of the dorsal side of their bodies. This rod is called a notochord. Primitive chordates have a notochord their entire lives. So do some lower vertebrates, such as the lamprey. But the notochord of the lamprey becomes surrounded by cartilage parts of the spinal column. In other vertebrates, the notochord appears only in the embryo. But early in life, it changes into the vertebral column, or backbone.

- All chordates have a tubular nerve cord. It lies just above the notochord on the dorsal side. The anterior end of this nerve cord develops into a brain. The remaining part becomes the spinal cord. Together, the brain and the spinal cord make up the central nervous system.

- All chordates have paired gill slits at some time in their lives. These gill slits form openings in the throat. Fish and the more primitive vertebrates have gill slits throughout life. The higher vertebrates, including reptiles, birds, and mammals, lose their gill slits very early in life.

Of the four chordate subphyla, we are familiar with the vertebrates. The other three subphyla are known more by biologists. These primitive chordates are all marine animals. Biologists find them interesting because they can give us an idea of what the ancestors of present-day vertebrates may have been like.



#109--THE PHYLUM CHORDATA

group of animals
- the most complex that have ever lived on this earth
- called chordates

has four subphyla

vertebrata
- largest
- most important
- one we are familiar with
- fish
- amphibians
- reptiles
- mammals
- birds

✱

other three subphyla
- are primitive chordates
- are all marine animals
- known more by biologists
- give us an idea of what the ancestors of present-day vertebrates may have been like → biologists find them interesting

different from all animals

by three factors

all embryos have notochord
- DEF: rod of connective tissue
  - along the length of the dorsal side of their bodies

primitive chordates
- have notochord their entire lives
  - (notochord never changes)

≈

some lower vertebrates
- have notochord their entire lives

but ✱

lamprey
- notochord becomes surrounded by cartilage parts of spinal column

✱

other vertebrates
- notochord appears only in embryo
  ↓
  - changes into a vertebral column
    - in early life
  - ≈ backbone

all chordates have a tubular nerve cord
- lies just above notochord
- on dorsal side
- has parts → together make up central nervous system
  - anterior end → becomes brain
  - remaining part → spinal cord

all chordates have paired gill slits at some time in their lives
- gill slits form opening in throat

some chordates
- fish
- the more primitive vertebrates
- have gill slits throughout their lives

higher vertebrates
- reptiles
- birds
- mammals
- lose gill slits
  - early in life

#109: THE PHYLUM CHORDATA

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
1.	1.2	1 the phylum chordata	0 PROP	0 group of complex
2.	2.2	0 group of animals	1 PROP	1 the most complex that have ever lived on the earth
3.	2.2	0 group of animals	0 PROP	0 called chordates
4.	1.2	1 the phylum chordata	1 PROP	1 has four subphyla
5.	3.3	1 has four subphyla	1 EXAMP	1 vertebrata
6.	3.32	1 vertebrata	1 PROP	1 largest
7.	3.32	1 vertebrata	1 PROP	1 most important
8.	3.32	1 vertebrata	1 PROP	1 one we are familiar with
9.	3.33	1 vertebrata	1 EXAMP	1 fish
10.	3.33	1 vertebrata	1 EXAMP	1 amphibians
11.	3.33	1 vertebrata	1 EXAMP	1 reptiles
12.	3.33	1 vertebrata	1 EXAMP	1 birds
13.	3.33	1 vertebrata	1 EXAMP	1 mammals
14.	3.3	1 has four subphyla	1 EXAMP	1 other three subphyla
15.	3.32	1 other three subphyla	0 PROP	1 are primitive chordates

#109: THE PHYLUM CHORDATA

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
		1	0	1
16.	3.32	other three subphyla	PROP	are all marine animals
		1	1	1
17.	3.32	other three subphyla	PROP	known more by biologists
		1	0	1
18.	3.325	one we are familiar with	NOT SIM	known more by biologists
		1	0	1
19.	3.32	other three subphyla	PROP	give us an idea of what the ancestors of present day vertebrates may have been like
		1	1	1
20.	3.32	other three subphyla	PROP	biologists find them interesting
		1	1	1
21.	3.327	give us an idea of what the ancestors of present day vertebrates may have been like	CAUS	biologists find them interesting
		1	1	1
22.	1.2	the phylum chordata	PROP	different from all other animals
		1	1	1
23.	4.2	different from all other animals	PROP	by three factors
		1	1	1
24.	4.23	by three factors	EXAMP	all embryos have notochord
		1	1	1
25.	4.231	notochord	DEF	rod of connective tissue along the length of the dorsal side of their bodies
		1	1	1
26.	4.2312	rod of connective tissue	PROP	along the length of the dorsal side of their bodies
		1	0	1
27.	4.233	all embryos have notochord	EXAMP	primitive chordates
		1	1	1
28.	4.2332	primitive chordates	PROP	have notochord their entire lives
		1	0	0
29.	4.23322	have notochord their entire lives	PROP	(notochord never changes)

#109: THE PHYLUM CHORDATA

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
30.	4.233	1 all embryos have notochord	0 EXAMP	1 some lower vertebrates
31.	4.2332	1 some lower vertebrates	1 PROP	0 have notochord their entire lives
32.	4.23324	1 have notochord their entire lives (cf. 28)	1 SIM	0 have notochord their entire lives (cf. 31)
33.	4.2333	1 lower vertebrates	1 EXAMP	1 lamprey
34.	4.23332	1 lamprey	1 PROP	1 notochord becomes surrounded by cartilage parts of spinal column
35.	4.233225	0 notochord never changes	0 NOT SIM	1 notochord becomes surrounded by cartilage parts of spinal column
36.	4.233	1 all embryos have notochord	0 EXAMP	1 other vertebrates
37.	4.2332	1 other vertebrates	1 PROP	1 notochord appears only in embryo
38.	4.23325	1 have notochord their entire lives (cf. 28,31)	0 NOT SIM	1 notochord appears only in embryo
39.	4.23326	1 notochord appears only in embryo	1 PREC	1 changes into a vertebral column
40.	4.233264	1 vertebral column	1 SIM	1 backbone
41.	4.233262	1 changes into vertebral column	1 PROP	1 in early life
42.	4.23	1 by three factors	1 EXAMP	1 all chordates have a tubular nerve cord
43.	4.232	1 all chordates have a tubular nerve cord	1 PROP	1 lies just above notochord

#109: THE PHYLUM CHORDATA

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
44.	4.232	all chordates have a tubular nerve cord	PROP	on dorsal side
		1	0	0
45.	4.232	all chordates have a tubular nerve cord	PROP	has parts
		0	0	1
46.	4.2323	has parts	EXAMP	anterior end
		1	1	1
47.	4.23236	anterior end	PREC	brain
		0	0	1
48.	4.2323	has parts	EXAMP	remaining part
		1	1	1
49.	4.23236	remaining parts	PREC	spinal cord
		0	0	1
50.	4.23236	has parts	PREC	together make up the central nervous system
		1	1	1
51.	4.232363	together make up the central nervous system	EXAMP	brain
		1	1	1
52.	4.232363	together make up the central nervous system	EXAMP	spinal cord
		1	1	1
53.	4.23	by three factors	EXAMP	all chordates have paired gill slits at some time in their lives
		1	1	1
54.	4.232	all chordates have paired gill slits at some time in their lives	PROP	gill slits form opening in throat
		1	0	0
55.	4.233	all chordates have paired gill slits at some time in their lives	EXAMP	some chordates
		0	0	1
56.	4.2333	some chordates	EXAMP	fish

#109: THE PHYLUM CHORDATA

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		0	0	1
57.	4.2333	some chordates	EXAMP	the more primitive vertebrates
		0	1	1
58.	4.2332	some chordates	PROP	have gill slits throughout their lives
		1	0	1
59.	4.233	all chordates have paired gill slits at some time in their lives	EXAMP	higher vertebrates
		1	1	1
60.	4.2333	higher vertebrates	EXAMP	reptiles
		1	1	1
61.	4.2333	higher vertebrates	EXAMP	birds
		1	1	1
62.	4.2333	higher vertebrates	EXAMP	mammals
		1	1	1
63.	4.2332	higher vertebrates	PROP	lose gill slits
		1	1	1
64.	4.23322	lose gill slits	PROP	early in life

#110 Class Chondrichthyes

Cartilage Fishes

Sharks, Rays, and Skates

Sharks, rays, and skates belong to the class Chondrichthyes. This means "cartilage fishes." It is thought that they developed early in the Devonian period. Of the fishes that lived in the ancient seas, many cartilage fishes have survived relatively unchanged in great numbers.

Sharks are similar to true fishes in many ways. But they have certain differences which place them in a separate class. Sharks have placoid scales which have the same origin as the shark's teeth. The shark's body is torpedo-shaped. It has fins like those of true fishes. The long upper lobe of the tail fin is a characteristic of ancient fishes. This type of tail fin forces the head of the shart downward as it moves through the water. The mouth is a horizontal slit on the ventral side of the head. The jaws of most sharks are lined with razor-sharp, pointed teeth. They have several rows of teeth. When a tooth is lost, another one may move forward to replace it. The teeth slant backward to hold the food securely in the mouth. This, combined with great strength, make the shark a fearsome hunter.

Water enters the mouth, where it passes over the gills on either side of the head. The water is then forced out through separate pairs of gill slits. The gills are the respiratory organs of the fish. The shark has large, well-developed eyes on either side of the head above the mouth. Paired nostrils on the ventral side of the head lead to olfactory sacs. These olfactory sacs sense odors in the water. As already mentioned, shark skeltons are made up of cartilage rather than bone.

# 110--CLASS CHONDRICHTYHES

DEF: Cartilage fishes

believed to have developed early in the Devonian period

are among the fishes in the ancient seas

many have survived relatively unchanged in great numbers

- sharks
  - true fishes
    - in many ways
  - but ≉
  - have certain differences ⟹ places then in a seperate class
  - have placoid scales
    - have same origin as shark's teeth
  - body is torpedo-shaped
  - has fins ≈ those of true fishes
    - tail fin
      - has long upper lobe → forces head to go down as shark moves through the water
        - characteristic of ancient fishes
  - mouth is a horizontal slit
    - on ventral side of head
  - jaws of most sharks are lined with teeth
    - razor-sharp
    - pointed
    - several rows
    - when one tooth is lost → another moves forward to replace it
    - teeth slant backward ⟹ food to be held securely in mouth ⟹ fearsome hunter
  - great strength ⟹ fearsome hunter
  - respiratory process
    - water enters mouth → water passes over gills → water forced out through seperate pairs of gill slits
      - located on either side of head
      - are respiratory organs of fish
- rays
- skates

(continuation of # 110)

has eyes		
	large	
	well-developed	
	located on either side of head above the mouth	
has paired nostrils		
	located on ventral side of the head	
	lead to olfactory sacs	
		sense odors in the water
skeletons are made of cartilage	rather than	made of bone

#110: SHARKS, RAYS AND SKATES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.1	1 class Chondrichthyes	1 DEF	1 cartilage fishes
2.	1.2	1 class Chondrichthyes	1 PROP	1 believed to have developed early in the Devonian period
3.	1.2	1 class Chondrichthyes	1 PROP	1 are among the fishes in the ancient seas
4.	1.2	1 class Chondrichthyes	1 PROP	1 many have survived relatively unchanged in great numbers
5.	1.3	1 class Chondrichthyes	1 EXAMP	1 sharks
6.	1.3	1 class Chondrichthyes	1 EXAMP	1 rays
7.	1.3	1 class Chondrichthyes	1 EXAMP	1 skates
8.	2.4	1 sharks	1 SIM	1 true fishes
9.	2.42	1 sharks are similar to true fishes (#8)	1 PROP	1 in many ways
10.	2.45	1 sharks are similar to true fishes (#8)	1 NOT SIM	1 Rel. Prop. #12
11.	2.2	1 sharks	1 PROP	1 have certain differences
12.	2.27	1 have certain differences	0 CAUS	1 places them in a separate class
13.	2.2	1 sharks	1 PROP	1 have placoid scales
14.	2.22	1 placoid scales	1 PROP	1 have sme origin as shark's teeth
15.	2.2	1 sharks	1 PROP	1 body is torpedo-shaped

#110: SHARKS, RAYS AND SKATES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
16.	2.2	1 sharks	1 PROP	1 has fins
17.	2.24	1 fins	1 SIM	1 those of true fishes
18.	2.23	1 fins	0 EXAMP	1 tail fin
19.	2.232	1 tail fin	1 PROP	1 long upper lobe
20.	2.2322	1 long upper lobe	1 PROP	1 is characteristic of ancient fishes
21.	2.23272	1 long upper lobe	1 CAUS	1 head (to go) down
22.	2.23272	1 forces head down	1 PROP	1 as shark moves through water
23.	2.2	1 sharks	0 PROP	1 mouth is a horizontal slit
24.	2.22	1 mouth is a horizontal slit	1 PROP	1 located on ventral side of head
25.	2.2	1 sharks	1 PROP	1 jaws of most sharks are lined with teeth
26.	2.22	1 teeth	1 PROP	1 razor-sharp
27.	2.22	1 teeth	1 PROP	1 pointed
28.	2.22	1 teeth	1 PROP	1 several rows
29.		1 jaws of most sharks are lined with teeth	1 PROP	1 Rel. Prop. #29
30.	2.2226	1 when one tooth lost	1 PREC	1 another moves forward to replace it
31.	2.222	jaws of most sharks are lined with teeth	PROP	teeth slant backward

#110: SHARKS, RAYS AND SKATES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
32.	2.222	1 jaws of most sharks are lined with teeth	1 PROP	1 teeth slant backward causes food to be held securely in mouth (#32)
33.	2.2227	1 teeth slant backward	1 CAUS	1 food to be held securely in mouth
34.	2.2227	1 Rel. Prop. #32	0 CAUS	1 fearsome hunter
35.	2.2	1 shark	1 PROP	1 great strength
36.	2.2	1 shark	1 PROP	1 fearsome hunter
37.	2.27	1 great strength	1 CAUS	1 fearsome hunter
38.	2.2	1 shark	0 PROP	0 respiratory process
39.	2.226	0 respiratory process	0 PROP	1 Rel. Prop. #40,43
40.	2.226	1 water enters the mouth	1 PREC	1 water passes over gills
41.	2.2262	1 gills	1 PROP	1 located on either side of head
42.	2.2262	1 gills	1 PROP	1 are respiratory organs of fish
43.	2.2266	1 water passes over gills	1 PREC	1 water forced out through separate pairs of gill slits
44.	2.2	1 sharks	1 PROP	1 has eyes
45.	2.22	1 eyes	1 PROP	1 large
46.	2.22	1 eyes	1 PROP	1 well-developed
47.	2.22	1 eyes	1 PROP	1 located on either side of its head above the mouth

#110: SHARKS, RAYS, AND SKATES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	0	1
48.	2.2	sharks	PROP	has paired nostrils
		1	1	1
49.	2.22	paired nostrils	PROP	located on ventral side of the head
		1	1	1
50.	2.22	paired nostrils	PROP	lead to the olfactory sacs
		1	1	1
51.	2.222	olfactory sacs	PROP	sense odors in the water
		1	1	1
52.	2.2	sharks	PROP	skeletons are made of cartilage
		1	1	1
53.	2.25	skeletons are made of cartilage	NOT SIM	made of bone

#111 Structures of the Trunk and Tail

Structures of the Trunk and Tail

Various kinds of fins develop from the trunk and tail. But all fins are made up of a double membrane supported by spiny rays. These rays are composed of cartilage. Fins serve many purposes. And they differ in form from species to species.

There are two kinds of paired fins. These are homologous to the limbs of other vertebrates. The pectoral fins are nearest the head. These correspond to the front legs. The pelvic fins are posterior to and below the pectoral fins. These correspond to the hind legs. These pelvic fins act like oars when a fish swims slowly. They also aid in steering and keeping balance when the fish is resting. They are also used when the fish moves backward.

There are several single fins. The caudal fin grows from the tail. It helps push the fish forward. Dorsal fins are found along the top of a fish's back. The anterior dorsal fin of the perch contains sharp spines. These spines act as a defense against attack. They raise toward the head, making the fish hard to swallow tail first. The posterior dorsal fin does not have spines. Both dorsal fins help the fish stay upright while swimming. Another single fin, called the anal fin, grows along the midline on the ventral side of the fish. Like the dorsal fins, the anal fin helps the fish keep its balance.

Powerful muscles occupy the region of the trunk above the spinal column. A thinner muscle layer lies along the body wall on the sides of the trunk. The tail region is nearly solid muscle.

Look at a fish closely. On each side, you can see a row of pitted scales in a line from the head to the tail fin. These make up the lateral line. Under these scales lie nerve endings and a narrow tube. The lateral line acts as a sense organ. It picks up low-frequency underwater vibrations and pressure stimuli.

# 111--STRUCTURES OF THE TRUNK AND TAIL

Fins

- serve many purposes
- differ in form from species to species
- all fins made up of double membranes
  - supported by spiny rays
    - composed of cartilage

but

various kinds of fins develop from the trunk and tail

- two kinds of paired fins ≈ limbs of other vertebrates
  - pectoral fins ≈ front legs
    - located nearest the head
  - pelvic fins ≈ hind legs
    - located posterior to pectoral fins
    - located below pectoral fins
    - act like oars
      - when a fish swims slowly
    - aid in steering
    - aid in keeping balance
      - when a fish is at rest
    - also used when fish moves backward
- Several single fins
  - caudal fin
    - grows from the tail
    - helps push fish forward
  - anal fin
    - grows from the tail
    - grows on ventral side of fish
    - helps fish keep its balance ≈
  - dorsal fins
    - found along top of fish's back
    - anterior dorsal fin
      - anterior dorsal fin of perch
        - contains sharp spines
          - raise toward head
            - ↓ makes fish hard to swallow tail first
            - acts as a defense agains attack
    - posterior dorsal fin
      - does not have spines
    - help fish stay upright while swimming

(continuation of # 111)

Muscles

region of trunk above spinal column	body wall on sides of the trunk	tail region
has powerful muscles	has thinner muscle layers	nearly solid muscle

Lateral line

DEF: row of pitted scales in a line from the head to the tail fin

seen when you look closely at a fish

one on each side of fish

has two structures under scales

- nerve endings
- a narrow tube

acts as a sense organ

picks up low-frequency underwater vibrations and pressure stimuli

#111: STRUCTURES OF THE TRUNK AND TAIL

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.3	1 structures of the trunk and tail	0 EXAMP	1 fins
2.	2.2	1 fins	1 PROP	1 serve many purposes
3.	2.2	1 fins	1 PROP	1 differ in form from species to species
4.	2.2	1 fins	1 PROP	1 all fins made up of double membranes
5.	2.22	1 all fins made up of double membrane	1 PROP	1 supported by spiny rays
6.	2.222	1 spiny rays	1 PROP	1 composed of cartilage
7.	2.25	1 all fins made up of double membrane	1 NOT SIM	1 various kinds of fins develop from the trunk and tail
8.	2.2	1 fins	1 PROP	1 various kinds of fins develop from the trunk and tail
9.	2.23	1 various kinds of fins develop from the trunk and tail	0 EXAMP	1 two kinds of paired fins
10.	2.4	1 two kinds of paired fins	1 SIM	1 limbs of other vertebrate
11.	2.3	1 two kinds of paired fins	1 EXAMP	1 pectoral fins
12.	2.34	1 pectoral fins	1 SIM	1 front legs
13.	2.43	1 limbs of other vertebrates	0 EXAMP	1 front legs
14.	2.32	1 pectoral fins	1 PROP	1 located nearest the head
15.	2.3	1 two kinds of paired fins	1 EXAMP	1 pelvic fins

#111: STRUCTURES OF THE TRUNK AND TAIL

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
16.	2.34	1 pelvic fins	1 SIM	1 hind legs
17.	2.43	1 limbs of other vertebrates	0 EXAMP	1 hind legs
18.	2.32	1 pelvic fins	1 PROP	1 located posterior to pectoral fins
19.	2.32	1 pelvic fins	1 PROP	1 located below pectoral fin
20.	2.32	1 pelvic fins	1 PROP	1 act like oars
21.	2.322	1 act like oars	1 PROP	1 when a fish swims slowly
22.	2.32	1 pelvic fins	1 PROP	1 aid in steering
23.	2.32	1 pelvic fins	1 PROP	1 aid in keeping balance
24.	2.322	1 aid in keeping balance	1 PROP	1 when a fish is at rest
25.	2.32	1 pelvic fins	1 PROP	1 also used when a fish moves backward
26.	2.23	1 various kinds of fins develop from the trunk and tail	0 EXAMP	1 several single fins
27.	3.3	1 several single fins	0 EXAMP	1 caudal fin
28.	3.32	1 caudal fin	1 PROP	1 grows from the tail
29.	3.32	1 caudal fin	1 PROP	1 helps push fish forward
30.	3.3	1 several single fins	1 EXAMP	1 anal fin
31.	3.32	1 anal fin	1 PROP	1 grows along midline

#111: STRUCTURES OF THE TRUNK AND TAIL

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
32.	3.32	1 anal fin	1 PROP	1 grows on ventral side of fish
33.	3.32	1 anal fin	1 PROP	1 helps fish keep its balance
34.	3.324	1 helps fish keep its balance	1 SIM	1 helps fish stay upright while swimming
35.	3.3	1 several single fins	0 EXAMP	1 dorsal fins
36.	3.32	1 dorsal fins	1 PROP	1 found along top of fish's back
37.	3.33	1 dorsal fins	0 EXAMP	1 anterior dorsal fin
38.	3.333	0 anterior dorsal fin	0 EXAMP	1 anterior dorsal fin of perch
39.	3.3332	1 anterior dorsal fin of perch	1 PROP	contains sharp spines
40.	3.33322	1 sharp spines	1 PROP	1 raise toward head
41.	3.33322	1 sharp spines	1 PROP	1 makes fish hard to swallow tail first
42.	3.33322	1 sharp spines	1 PROP	1 raise toward head causes fish hard to swallow tail first
43.	3.333227	1 raise toward head	1 CAUS	1 makes firsh hard to swallow tail first
44.	3.33322	1 sharp spines	1 PROP	1 act as defense against attack
45.	3.333227	1 raise toward head makes fish hard to swallow tail first	0 CAUS	1 act as defense against attack
46.	3.33	1 dorsal fins	0 EXAMP	1 posterior dorsal fin
47.	3.332	1 posterior dorsal fin	0 PROP	1 does not have spines

#111: STRUCTURES OF THE TRUNK AND TAIL

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
48.	3.32	1 dorsal fins	1 PROP	1 helps fish stay upright while swimming
49.	1.3	1 structures of the trunk and tail	0 EXAMP	0 muscles
50.	4.3	0 muscles	0 EXAMP	1 region of trunk above spinal cord
51.	4.32	1 region of trunk above spinal column	1 PROP	1 has powerful muscles
52.	4.3	0 muscles	0 EXAMP	1 body wall on sides of trunk
53.	4.32	1 body wall on sides of trunk	1 PROP	1 has thinner muscle layer
54.	4.3	0 muscles	0 EXAMP	1 tail region
55.	4.32	1 tail region	1 PROP	1 nearly solid muscle
56.	1.3	1 structures of trunk and tail	0 EXAMP	1 lateral line
57.	5.1	1 lateral line	0 DEF	1 row of pitted scales in a line from the head to the tail fin
58.	5.2	1 lateral line	0 PROP	1 seen when you look closely at a fish
59.	5.2	1 lateral line	0 PROP	1 one on each side of fish
60.	5.2	1 lateral line	1 PROP	1 has two structures under scales
61.	5.23	0 two structures under scales	1 EXAMP	1 nerve endings
62.	5.23	0 two structures under scales	1 EXAMP	1 a narrow tube
63.	5.2	1 lateral line	1 PROP	1 acts as a sense organ

#111: STRUCTURES OF THE TRUNK AND TAIL

#	embed- dedness	CONCEPT A	RELATION- SHIP	CONCEPT B
		1	1	1
64.		acts as a sense organ 5.22	PROP	picks up low-frequency underwater vibrations and pressure stimuli

#112 Reproduction in Fishes

Reproduction in Fishes

The reproductive organs of fish are called gonads. They lie in the posterior part of the body cavity above the digestive organs. The opening from the gonads is just behind the anal opening.

The reproductive organs of the female fish are called ovaries. These produce eggs over a period of several months. As the eggs grow, the ovaries swell and may bulge the sides of the fish. In many fish, including the yellow perch, paired ovaries fuse into a single ovary during the embryonic growth.

In male fish, the sex organs are called testes. These develop sperm cells. When the female lays the eggs, or spawns, the male swims over them. The male discharges milt onto the eggs. Milt is a fluid containing the sperm. The sperms swin to the eggs and fertilize them. This is external fertilization.

Fertilized eggs begin to develop into embryos. This may take from a couple of days to many weeks, depending on the species and the water temperature. As the embryo develops, it is nourished by special food in the egg. This food is called yolk. The yolk is a large amount of nonliving material held in the egg. A yolk sac remains attached to a baby fish for a short time after it hatches.

In most fishes, spawning is not very efficient. Many eggs are never fertilized. Therefore, they never develop. And, many fertilized eggs are eaten before hatching by predators. Those baby fish that do hatch are in constant danger of being eaten by bigger fish and other water animals. How does a fish species continue to survive under these harsh conditions? The species survives because of the large number of eggs that are laid. A female fish spawns anywhere from 500 to seven million eggs depending upon the species.

# 112--REPRODUCTION IN FISHES

Involves gonads
- DEF: the reproductive organs of the fish
- lie in body cavity
  - in posterior part of
  - above digestive organs
- have openings
  - just behind anal opening

Ovaries
- DEF: reproductive organs of female fish
- producc eggs
  - over a period of several months
- as eggs grow → ovaries swell ⇒ sides of fish may bulge
- paired ovaries may fuse into a single ovary
  - during embryonic growth
  - in many fish
- in yellow perch

Testes
- DEF: sex organs of male fish
- develop sperm cells

Reproductive process
- External fertilization
  - female spawns → male swims over the eggs → male discharges milt → →
    - DEF: lays the eggs
    - DEF: (milt) a fluid containing the sperm
    - onto the eggs
  - sperm swims to eggs
  - sperm fertilizes eggs
- → fertilized eggs begin to develop → baby fish hatches → yolk sac remains attached to baby fish
  - into embryos
    - may take from a couple of days to many weeks
      - depends on species
      - depends on water temperature
    - nourished by yolk
      - DEF: (yolk) large amount of non living material held in egg
      - special food in the egg
  - for a short time

takes place under harsh conditions
- spawning is not very efficient
- many eggs are never fertilized ⇒ never develop
- many eggs are eaten before hatching by predators
- baby fish may be eaten by bigger fish and other water animals

⇒ question: how does a fish species continue to survive?
- large numbers of eggs are laid ⇒ species to survive
  - female fish spawn anywhere from 500 to 7 million eggs
  - depends upon the species

#112: REPRODUCTION IN FISHES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	1 reproduction in fishes	0 PROP	1 involves gonads
2.	2.1	1 gonads	1 DEF	1 the reproductive organs of the fish
3.	2.2	1 gonads	1 PROP	1 lie in body cavity
4.	2.22	1 lie in body cavity	1 PROP	1 in posterior part of
5.	2.22	1 lie in body cavity	1 PROP	1 above digestive organs
6.	2.2	1 gonads	1 PROP	1 have openings
7.	2.22	1 opening	1 PROP	1 just behind anal opening
8.	2.3	1 gonads	0 EXAMP	1 ovaries
9.	2.31	1 ovaries	1 PROP	1 reproductive organs of female fish
10.	2.32	1 ovaries	1 PROP	1 produce eggs
11.	2.322	1 produce eggs	1 PROP	1 over a period of several months
12.	2.32	1 ovaries	1 PROP	1 as eggs grow then ovaries swell (#13) causes sides of fish to bulge (#14)
13.	2.326	1 as eggs grow	0 PREC	1 ovaries swell
14.	2.3267	1 ovaries swell	0 CAUS	1 sides of fish may bulge
15.	2.32	1 ovaries	1 PROP	1 paired ovaries may fuse into a single ovary

#112: REPRODUCTION IN FISHES

#	embeddedness	CONCEPT A	RELATIONSHIP	CONCEPT B
		1	1	1
16.	2.322	paired ovaries may fuse into a single ovary	PROP	during embryonic growth
		1	1	1
17.	2.322	paired ovaries may fuse into a single ovary	PROP	in many fish
		1	1	1
18.	2.323	paired ovaries may fuse into a single ovary	EXAMP	in yellow perch
		1	0	1
19.	2.3	gonads	EXAMP	testes
		1	1	1
20.	2.31	testes	DEF	sex organs of male fish
		1	1	1
21.	2.32	testes	PROP	develop sperm cells
		1	0	0
22.	1.2	reproduction in fishes	PROP	reproductive process
		0	0	0
23.	3.2	reproductive process	PROP	Rel. Prop. #24,32,40,41
		1	0	0
24.	3.22	external fertilization	PROP	Rel. Prop. #25,27,30,31
		1	0	1
25.	3.226	female spawns	PREC	male swims over the eggs
		1	1	1
26.	3.221	female spawns	DEF	lays the eggs
		1	0	1
27.	3.2266	male swims over the eggs	PREC	male discharges milt
		1	1	1
28.	3.22661	milt	DEF	a fluid containing the sperm
		1	1	1
29.	3.22662	male discharges milt	PROP	onto the eggs

#112: REPRODUCTION IN FISHES

#	embed-dedness	CONCEPT A	SHIP	CONCEPT B
30.	3.22666	1 male discharges milt	0 PREC	1 sperm swims to eggs
31.	3.22666	1 sperm swims to eggs	0 PREC	1 sperm fertilizes the eggs
32.	3.26	1 external fertilization	0 PREC	1 fertilized eggs begin to develop
33.	3.262	1 fertilized eggs begin to develop	1 PROP	1 into embryos
34.	3.2622	1 develop into embryos	1 PROP	1 may take from a couple of days to many weeks
35.	3.26222	1 may take from a couple of days to many weeks	1 PROP	1 depends on species
36.	3.26222	1 may take from a couple of days to many weeks	1 PROP	1 depends on water temperature
37.	3.2622	1 develop into embryos	1 PROP	1 nourished by yolk
38.	3.26221	1 yolk	1 DEF	1 large amount of nonliving material held in egg
39.	3.26222	1 yolk	1 PROP	1 special food in the egg
40.	3.266	1 fertilized egg begins to develop	0 PREC	1 baby fish hatches
41.	3.2666	1 baby fish hatches	1 PREC	1 yolk sac remains attached to baby fish
42.	3.26662	1 yolk sac remains attached to baby fish	1 PROP	1 for a short time
43.	1.2	1 reproduction in fishes	0 PROP	1 takes place under harsh conditions

#112: REPRODUCTION IN FISHES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
44.	4.3	1 takes place under harsh conditions	0 EXAMP	1 spawning is not very efficient
45.	4.3	1 takes place under harsh conditions	0 EXAMP	1 many eggs are never fertilized causes never develop
46.	4.37	1 many eggs are never fertilized	1 CAUS	1 never develop
47.	4.3	1 takes place under harsh conditions	0 EXAMP	1 many eggs are eaten before hatching by predators
48.	4.3	1 takes place under harsh conditions	0 EXAMP	1 baby fish may be eaten by bigger fish and other water animals
49.	4.7	1 takes place under harsh conditions	0 CAUS	1 question: how does a fish species continue to survive?
50.	4.72	1 question: how does a fish species continue to survive?	1 PROP	1 large number of eggs are laid causes species to survive (51)
51.	4.727	1 large number of eggs are laid	1 CAUS	1 species to survive
52.	4.723	1 large number of eggs are laid	0 EXAMP	1 female fish spawn anywhere from 500 to 7 million eggs
53.		1 female fish spawns anywhere from 500 to 7 million eggs	1 PROP	1 depends upon the species

#113 Systems of Classification in Biology

Four Kingdoms

Notice that the differences between plants and animals are matters of degree. Plants are complex, responsive, and motile. Animals are more so. Animal cells have some strength and rigidity, but plant cells have even more. Plants contain some salt, but animals contain more of it. It seems as if the plant and animal kingdoms should overlap. Indeed they do.

When we get down to the smaller and simpler organisms, it is often hard to tell which are animals and which are plant. For this reason many biologists recognize one or more additional kingdoms. These take in organisms which are neither definitely plants nor definitely animals.

In this book organisms are grouped in the four kingdoms of monera, protists, plants, and animals. Other books may use slightly different classifications. The four kingdoms are shown in Plates 1-8, and are discussed in the three remaining chapters of this unit.

Systems of classification are useful in biology because they show relationships and help to organize information. However, they are human creations, not unchangeable natural law. None is likely to satisfy all biologists. The organisms carry on their life functions unchanged, no matter how biologists may classify them.

#113--SYSTEMS OF CLASSIFICATION IN BIOLOGY

Four kingdoms

differences between plants and animals

are a matter of degree

plants		animals
complex	<	complex
responsive	<	responsive
motile	<	motile
contain some salt	<	contain some salt
cells have strength	>	cells have strength
cells have rigidity	>	cells have rigidity

It seems as if the plant and animal kingdoms should overlap

plant and animal kingdoms do overlap

when we study smaller, simpler organisms

it is hard to tell which are plants and which are animals

biologists to recognize one or more additional kingdoms

take in organisms that are not either plants or animals

monera   protists

are grouped in this book

monera   protists   plants   animals

✳ other books may use slightly different classifications

four kingdoms are shown in plates 1-8

four kingdoms are discussed in three remaining chapters of unit

show relationships
organize information
⟹ systems are useful in biology

✳

human creations ✳ not unchangeable natural law

none is likely to satisfy all biologists

it doesn't matter how biologists classify organisms

organisms carry on life functions unchanged

#113: FOUR KINGDOMS

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
1.	1.3	1 systems of classification of biology	0 EXAMP	1 four kingdoms
2.	2.2	1 four kingdoms of organisms	0 PROP	1 differences between plants and animals
3.	3.2	1 differences between plants and animals	1 PROP	1 are a matter of degrees
4.	3.3	1 differences between plants and animals	0 EXAMP	1 plants
5.	3.3	1 differences between plants and animals	0 EXAMP	1 animals
6.	3.32	1 plants	1 PROP	1 complex
7.	3.32	1 animals	1 PROP	0 responsive
8.	3.329	1 plants property complex	0 LESSER	0 animals property complex (7)
9.	3.32	1 plants	1 PROP	1 responsive
10.	3.32	1 animals	1 PROP	0 responsive
11.	3.329	1 plants property responsive (9)	0 LESSER	0 animals property responsive (10)
12.	3.32	1 plants	1 PROP	1 motile
13.	3.32	1 animals	1 PROP	0 motile
14.	3.329	1 plants property motile (12)	0 LESSER	0 animals property motile (13)

#113: FOUR KINGDOMS

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
15.	3.32	1 plants	1 PROP	1 contain some salt
16.	3.32	1 animals	1 PROP	1 contain some salt
17.	3.329	1 plants contain some salt	0 LESSER	1 animals contain some salt
18.	3.32	1 plants	1 PROP	0 cells have strength
19.	3.32	1 animals	1 PROP	1 cells have strength
20.	3.328	0 plants property cells have strength	1 GREATER	1 animals property cells have strength
21.	3.32	1 plants	1 PROP	0 cells have rigidity
22.	3.32	1 animals	1 PROP	1 cells have rigidity
23.	3.328	0 plants property cells have rigidity	1 GREATER	1 animals property cells have rigidity
24.	3.2	1 differences between plants and animals	0 PROP	1 it seems as if the plant and animal kingdoms should overlap
25.	3.2	1 differences between plants and animals	0 PROP	1 plant and animal kingdoms do overlap
26.	3.23	1 plant and animal kingdom to overlap	0 EXAMP	1 Rel. Prop. #27,28
27.	3.236	1 when we study smaller, simpler organisms	0 PREC	1 it is hard to tell which are plants and which are animals

#113: FOUR KINGDOMS

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
28.	3.2367	1 it is hard to tell which are plants and which are animals	1 CAUS	1 biologists to recognize one or more additional kingdoms
29.	3.23672	1 one or more additional kingdoms	1 PROP	1 take in organisms that are not either plants or animals
30.	3.236723	1 organisms that are not either plants or animals	0 EXAMP	1 monera
31.	3.236723	1 organisms that are not either plants or animals	0 EXAMP	1 protists
32.	2.2	1 four kingdoms of organisms	1 PROP	1 are grouped in this book
33.	4.3	1 are grouped in this book	1 EXAMP	1 monera
34.	4.3	1 are grouped in this book	1 EXAMP	1 protists
35.	4.3	1 are grouped in this book	1 EXAMP	1 plants
36.	4.3	1 are grouped in this book	1 EXAMP	1 animals
37.	4.5	1 are grouped in this book	1 NOT SIM	1 other books may use slightly different classification
38.	4.2	1 are grouped in this book	1 PROP	1 four kingdoms are shown in plate 1-8
39.	4.2	1 are grouped in this book	1 PROP	1 four kingdoms are discussed in three remaining chapters of unit
40.	1.2	1 systems of classification in biology	1 PROP	1 show relationships
41.	1.2	1 systems of classification in biology	1 PROP	1 organize information

#113: FOUR KINGDOMS

#	embed- dedness	CONCEPT A	RELATION- SHIP	CONCEPT B
42.	1.27	1 show relationship and organize information	1 CAUS	1 systems are useful in biology
43.	1.2	1 systems of classification in biology	1 PROP	1 systems are useful in biology
44.	1.2	1 systems of classification in biology	1 PROP	1 human creations
45.	1.2	1 systems of classification in biology	1 PROP	1 not unchangeable natural law
46.	1.25	1 human creations	1 NOT SIM	1 unchanging natural law
47.	1.275	1 Rel. Prop. #42	1 NOT SIM	1 Rel. Prop. #46
48.	1.2	1 systems of classification in biology	1 PROP	1 none is likely to satisfy all biologists
49.	1.2	1 systems of classification in biology	0 PROP	1 it doesn't matter how biologists classify organisms
50.	1.22	1 it doesn't matter how biologists classify organisms	1 PROP	1 organisms carry on life functions unchanged

#114 Flagellates

Flagellates

The flagellates have long been a biological battleground. Zoologists claim them as animals and place them with the protozoa. Botanists regard them basically as plants and include them with the algae.

We meet this situation by calling them protists. Yet we recognize that some are indeed plants, some are animals, and still others seem to belong to both kingdoms.

Euglena illustrates the problem (Fig. 6-10A). This protist is abundant in poluted water and in quiet ponds, where it forms a green scum. Euglena's tolerance of low pH enables it to live in acid sphagnum bogs. A protective cover forms when conditions become unfavorable.

The spindle-shaped cell has two flagella, a sensitive eyespot, and chloroplasts. Although related to the green algae, it stores the carbohydrate paramylum rather than starch.

A related flagellate, Khawkinia (B), is similar to euglena but lacks chlorophyll. If euglena is kept in the dark or is treated with streptomycin, it loses its chlorophyll. Like khawkinia, it absorbs food from the water.

In another flagellate pair (C and D), Cryptomonas is green, Chilomonas is non-green. Both can consume prey whole, as animals do. In this welter of varied flagellates, where do we draw the line between plants and animals?

Biologists disagree in their answers to the last question. Yet they are almost unanimous in accepting the evidence that most higher organisms evolved from flagellates. Some flagellates at times lose their flagella and move by means of flowing protoplasm, like the ameba, a protozoan. The flagellate Protospongia closely resembles the collar cells of sponges. These resemblances seem to show relationship.

#114--FLAGELLATES

Have long been a biological battleground

- zoologists
  - claim as animals
  - place with protozoa
- ✳
- botanists
  - regard basically as plants
  - include them with algae

we call them protists ✳

- we recognize that some are indeed plants
- we recognize that some are animals
- still others seems to belong to both kingdoms → a welter of varied flagellates →

Euglena
- illustrates this problem
- in Figure 6-10A
- a protist
- abundant in polluted water → forms a green scum
- abundant in quiet ponds
- has a tolerance of low PH ⇒ (enables to) lives in acid sphagnum bogs
- unfavorable conditions ⇒ protective cover to form
- a cell
  - spindle-shaped
  - has two flagella
  - a sensitive eyespot
  - chloroplasts
- ✳ (although) related to green algae
  - stores starch
  - ✳ (rather than)
- stores paramylum
  - a carbohydrate
- when kept in dark
  ≈ (or)
  treated with streptomycin
  ↓
  loses chlorophyll
- absorbs food from water

a flagellate pair

cryptomonas	chilomonas
Figure C	Figure D
green	non-green
consume prey whole	consume prey whole

≈ as do all animals

≈ khawkinia
- Figure B
- flagellate related to Euglena
- ✳ but
- lacks chlorophyll
- ≈ absorbs food from water

→ where do we draw the line between plants and animals?
- biologists disagree in their answers to this question
- yet ✳ they are unanimous in accepting the evidence
  - flagellates → most higher organisms (are evolved from)
    - relationship shown by these resemblances

some flagellates	the ameba
lose their flagella →	a protozoan move by means of flowing protoplasm
last times	

protospongia	≈ collar cells of sponges
flagellate	
closely	

#114: FLAGELLATES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	1 Flagellates	1 PROP	1 have long been a biological battleground
2.	1.23	1 have long been a biological battleground	0 EXAMP	1 Zoologists
3.	1.232	1 zoologists	1 PROP	1 claim as animals
4.	1.232	1 zoologists	1 PROP	1 place with protozoa
5.	1.23	1 have long been a biological battleground	0 EXAMP	1 botanists
6.	1.232	1 botanists	1 PROP	1 regard basically as plants
7.	1.232	1 botanists	1 PROP	1 include them with algae
8.	1.235	1 zoologists	0 NOT SIM	1 botanists
9.	1.2356	0 zoologists is not similar to botanists	0 PREC	1 we call them protists
10.	1.2	1 flagellates	0 PROP	1 we call them protists
11.	1.2	1 flagellates	0 PROP	1 we recognize that some are indeed plants
12.	1.2	1 flagellates	0 PROP	1 we recognize that some are animals
13.	1.2	1 flagellates	0 PROP	1 still others seem to belong to both kingdoms
14.	1.25	1 we call them protists	1 NOT SIM	1 we recognize that some are indeed plants

#114: FLAGELLATES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
15.	1.25	1 we call them protists	1 NOT SIM	1 we recognize that some are animals
16.	1.25	1 we call them protists	1 NOT SIM	1 still others seem to belong to both kingdoms
17.	2.3	1 still others seem to belong to both kingdoms	0 EXAMP	1 Euglena
18.	2.32	1 Euglena	1 PROP	1 illustrates this problem
19.	2.32	1 Euglena	1 PROP	1 in Figure 6-10A
20.	2.32	1 Euglena	1 PROP	1 a protist
21.	2.32	1 Euglena	1 PROP	1 abundant in polluted water
22.	2.32	1 Euglena	1 PROP	1 abundant in quiet ponds
23.	2.32	1 Euglena	1 PROP	1 forms a green scum
24.	2.326	1 abundant in polluted water and in quiet ponds	0 PREC	1 forms a green scum
25.	2.32	1 Euglena	1 PROP	1 has a tolerance of low PH
26.	2.32	1 Euglena	1 PROP	1 lives in acid sphagnum bogs
27.	2.327	1 has a tolerance of low PH	1 CAUS	1 lives in acid sphagnum bogs
28.	2.32	1 Euglena	1 PROP	1 Rel. Prop. #29
29.	2.327	1 unfavorable conditions	0 CAUS	1 protective cover to form

#114: FLAGELLATES

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
30.	2.32	1 Euglena	0 PROP	1 a cell
31.	2.322	1 a cell	1 PROP	1 spindle-shaped
32.	2.322	1 a cell	1 PROP	1 has two flagella
33.	2.322	1 a cell	1 PROP	1 a sensitive eyespot
34.	2.322	1 a cell	1 PROP	1 chloroplasts
35.	2.35	1 Euglena	1 NOT SIM	1 related to green algae
36.	2.32	1 Euglena	1 PROP	1 related to green algae
37.	2.322	1 green algae	0 PROP	1 stores starch
38.	2.32	1 Euglena	1 PROP	1 stores paramylum
39.	2.322	1 paramylum	1 PROP	1 a carbohydrate
40.	2.3225	1 stores starch	1 NOT SIM	1 stores paramylum
41.	2.32	1 Euglena	1 PROP	1 Rel. Prop. #42,43
42.	2.324	1 when kept in dark	0 SIM	1 treated with streptomycin
43.	2.3246	1 Rel. Prop. #42	1 PREC	1 loses chlorophyll
44.	2.32	1 Euglena	1 PROP	1 absorbs food from water

#114: FLAGELLATES

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
45.	2.3	1 still others seem to belong to both kingdoms	0 EXAMP	1 Khawkinia
46.	2.32464	1 Rel. Prop. #42,43	0 SIM	1 Khawkinia
47.	2.32	1 Khawkinia	1 PROP	1 Figure (B)
48.	2.32	1 Khawkinia	1 PROP	1 flagellate related to Euglena
49.	2.32	1 Khawkinia	1 PROP	1 lacks chlorophyll
50.	2.325	1 flagellate related to Euglena	1 NOT SIM	1 lacks chlorophyll
51.	2.32	1 Khawkinia	1 PROP	1 absorbs food from water
52.	2.324	1 absorbs food from water (44)	1 SIM	1 absorbs food from water (51)
53.	2.3	1 still others seem to belong to both kingdoms	0 EXAMP	1 a flagellate pair
54.	2.33	1 a flagellate pair	1 EXAMP	1 Cryptomonas
55.	2.332	1 Cryptomonas	1 PROP	1 Figure (C)
56.	2.332	1 Cryptomonas	1 PROP	1 green
57.	2.332	1 Cryptomonas	1 PROP	1 consume prey whole
58.	2.3324	1 consume prey whole	1 SIM	1 all animals do
59.	2.33	1 a flagellate pair	1 EXAMP	1 Chilomonas

#114: FLAGELLATES

#	embeddedness	CONCEPT A	RELATIONSHIP	CONCEPT B
60.	2.332	1 Chilomonas	1 PROP	1 Figure (D)
61.	2.332	1 Chilomonas	1 PROP	1 non-green
62.	2.332	1 Chilomonas	1 PROP	1 consume prey whole
63.	2.3324	1 consume prey whole	1 SIM	1 all animals do
64.	2.3325	1 green (56)	0 NOT SIM	1 non-green (51)
65.	2.3324	1 consume prey whole (57)	1 SIM	1 consume prey whole (62)
66.	2.36	1 still others seem to belong to both kingdoms	0 PREC	1 a welter of varied flagellates
67.	2.366	1 a welter of varied flagellates	0 PREC	1 when to we draw the line between plants and animals
68.	3.2	1 where do we draw the line between plants and animals	1 PROP	1 biologists disagree in their answers to this question
69.	3.25	1 biologists disagree in their answers to this question	1 NOT SIM	1 Rel. Prop. #70,71
70.	3.252	1 they are almost unanimous in accepting the evidence	1 PROP	1 Rel. Prop. #71
71.	3.2526	1 flagellates	1 PREC	1 most higher organisms (are evolved from)
72.	3.2522	1 flagellates precedes most higher organisms (are evolved from) (71)	0 PROP	1 relationship shown by these resemblances

#114: FLAGELLATES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
73.	3.25223	1 relationship shown by these resemblances	0 EXAMP	1 some flagellates are similar to the ameba (74)
74.	3.252234	1 some flagellates	1 SIM	1 the ameba
75.	3.252232	1 some flagellates	1 PROP	1 lose their flagella
76.	3.2522322	1 lose their flagella	1 PROP	1 at times
77.	3.252232	1 some flagellates	1 PROP	1 move by means of flowing protoplasm
78.	3.25223226	1 lose their flagella	0 PREC	1 move by means of flowing protoplasm
79.	3.2522342	1 the ameba	1 PROP	1 moves by means of flowing protoplasm
80.	3.2522342	1 the ameba	1 PROP	1 a protozoan
81.	3.25223	1 relationship shown by these resemblances	0 EXAMP	1 Rel. Prop. #82
82.	3.252234	1 protospongia	1 SIM	1 collar cells of sponges
83.	3.252232	1 protospongia	1 PROP	1 flagellate
84.	3.2522342	1 Rel. Prop. #82	1 PROP	1 closely

#115 Linnaean System

(no heading)

The Linnaean system uses binomial classification. Each species has a unique name based on its genus and its species, for example *Equus caballus*. The name is always in Latin.

The scientist who first identifies a new species has the right to name it, provided a description is published in a recognized journal. An original specimen must also be deposited in some collection where others can study it.

The rules are made by international congresses. Biologists sincerely try to obey them.

We still use Linnaeus' basic system, though we look at the system differently. Linnaeus believed that species were fixed and unchanging. We now believe that species change and evolve.

Thus no species lasts forever. Eventually it disappears. Either it becomes extinct, or it changes into one or more new species. Since the change is gradual, it is often hard to decide when a species has split up.

Biologists often disagree as to whether groups or organisms have drifted far enough apart to be called separate species, or whether they still belong together.

Another difference is that Linnaeus placed all horses in the same species because they are similar. We now emphasize that all horses are similar only because they had a common ancestor. Horses, donkeys, and zebras are grouped in the family Equidae because they descended from the same even more remote ancestors.

Finally, to Linnaeus a species was represented by the type specimen deposited in a museum. Variations from the type were regarded almost as nuisances. We now stress that a species is a population which always shows considerable natural variation. Horses do not have to be exactly alike to form a valid species.

# 115--LINNAEAN SYSTEM

- uses binomial classification
  - each species has a unique name
    - based upon its genus and species
      - Equus caballus
    - always in Latin
  - rules for naming new species
    - scientis who first identifies a new species must do two things → scientist has right to name it
      - publish a description in a recognized journal

        and
      - deposit an original specimen in some collection
        - where others can study it
    - made by international congresses
    - biologists sincerely try to obey them

(continuation of # 115)

we still use the basic system

though we look at it differently

species change and evolve

thus ⟹

no species lasts forever — eventually it disappears

either

species becomes extinct

or

species changes into one or more new species

change is gradual

⇓

hard to decide when the species have split up

⇓

biologists often disagree as to whether

groups or organisms have drifted far enough apart to be called a seperate species

or

they still belong together

members of species have common ancestor ⟹ members to be placed in same group

horses had common ancestor ⟹ horses are similar

horses, donkeys and zebras are descended from the same ancestors ⟹ they are grouped in the same family Equidae

even more remote

we now emphasize

another difference

a species is a population which always shows considerable natural variation

horses do not have to be exactly alike to form a valid species

we now stree

finally

Linnaeus' use of the system

species are fixed and unchanging

members of species are similar ⟹ members to be placed in same species

horses are similar ⟹ horses to be placed in same species

a species was represented by the type specimen deposited in a museum

variations from the type were regarded almost as nuisances

#115:

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	1 Linnaean System	1 PROP	1 uses binomial classification
2.	2.2	1 uses binomial classification	0 PROP	1 each species has a unique name
3.	2.22	1 each species has a unique name	1 PROP	1 based upon its genus and species
4.	2.223	1 based upon its genus and species	1 EXAMP	1 Equus caballus
5.	2.22	1 each species has a unique name	1 PROP	1 always in Latin
6.	2.2	1 uses binomial classification	0 PROP	0 rules for naming new species
7.	2.23	0 rules for naming new species	0 EXAMP	0 scientist who first identifies a new species must (do two things)
8.	2.233	0 scientist who first identifies a new species must (do two things)	0 EXAMP	1 publish a description in a recognized journal
9.	2.233	0 scientist who first identifies a new species must (do two things)	0 EXAMP	1 deposit an original specimen in some collection
10.	2.2332	1 deposit an original specimen in some collection	1 PROP	1 where others can study it
11.	2.236	0 scientist who first identifies a new species must (do two things)	0 PREC	1 scientist has right to name it
12.	2.22	0 rules for naming new species	1 PROP	1 made by international congresses

#115:

#	embeddedness	CONCEPT A	RELATIONSHIP	CONCEPT B
		0	1	1
13.	2.22	rules for naming new species	PROP	biologists sincerely try to obey them
		1	1	1
14.	1.2	Linnaean System	PROP	we still use the basic system
		1	1	1
15.	3.5	We still use the basic system	NOT SIM	we look at it differently
		1	1	0
16.	3.5	We still use the basic system	NOT SIM	Linnaeus' use of the system
		1	0	1
17.	3.3	We still use the basic system	EXAMP	Rel. Prop. #18,19
		1	1	1
18.	3.37	species change and evolve	CAUS	no species lasts forever (eventually it disappears)
		1	0	1
19.	3.374	no species lasts forever	EXAMP	eventually it disappears
		1	0	1
20.	3.373	Rel. Prop. #19	EXAMP	either species becomes extinct
		1	0	1
21.	3.373	Rel. Prop. #19	EXAMP	or species changes into one or more new species
		1	0	1
22.	3.3735	species becomes extinct	NOT SIM	species changes into one or more new species
		1	1	1
23.	3.3732	species changes into one or more	PROP	change is gradual
		1	1	1
24.	3.37327	change is gradual	CAUS	hard to decide when the species have split up
		1	0	1
25.		hard to decide when the species	CAUS	biologists often disagree as to whether
		1	1	1
26.	3.3732773	biologists often disagree as to whether	EXAMP	groups or organisms have drifted far enough apart to be called a separate species

#115:

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
27.	3.3732773	1 biologists often disagree as to whether	1 EXAMP	1 they still belong together
28.	3.37327735	1 groups or organisms have drifted far enough apart to be called a separate species	0 NOT SIM	1 they still belong together
29.	4.3	0 Linnaeus' use of the system	0 EXAMP	1 species are fixed and unchanging
30.	3.35	1 Rel. Prop. #18	1 NOT SIM	1 species are fixed and unchanging
31.	3.3	1 We still use the basic system	0 EXAMP	0 Rel. Prop. #32
32.	3.37	0 members of species have common ancestor	1 CAUS	0 members to be placed in same group
33.	3.33	0 members of species have common ancestor	1 EXAMP	0 Rel. Prop. #34
34.	3.337	1 horses had common ancestor	1 CAUS	1 horses are similar
35.	3.33	0 Rel. Prop. #32	0 EXAMP	1 Rel. Prop. #36
36.	3.337	1 horses, donkeys and zebras are descended from the same ancestors	1 CAUS	1 they are grouped in the same family Equidae
37.	3.332	1 horses, donkeys, and zebras are descended from the same ancestors	1 PROP	1 even more remote
38.	3.32	0 Rel. Prop. #32	1 PROP	1 we now emphasize

#115:

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
39.	4.3	0 Linnaeus' use of the system	0 EXAMP	0 Rel. Prop. #40
40.		0 members of species are similar	1 CAUS	0 members to be placed in same species
41.	4.33	0 Rel. Prop. #40	0 EXAMP	1 Rel. Prop. #42
42.	4.337	1 horses are similar	1 CAUS	1 horses to be placed in same species
43.	3.35	0 Rel. Prop. #32	1 NOT SIM	0 Rel. Prop. #40
44.	3.352	0 Rel. Prop. #43	1 PROP	1 another difference
45.	3.3	1 We still use the basic system	0 EXAMP	1 a species is a population which always shows considerable natural variation
46.	3.33	1 a species is a population which always shows considerable natural variation	0 EXAMP	1 horses do not have to be exactly alike to form a valid species
47.	3.32	1 a species is a population which always shows considerable natural variation	1 PROP	1 we now stress
48.	4.3	0 Linnaeus' use of the system	0 EXAMP	1 a species was represented by the type specimen deposited in a museum
49.	4.32	1 a species was represented by the type specimen deposited in a museum	1 PROP	1 variations from the type were regarded almost as nuisances
50.	3.35	1 a species is a population which always shows considerable natural variation	1 NOT SIM	1 a species was represented by the type specimen deposited in a musuem

#115:

#	embed-dedness	CONCEPT A	SHIP		CONCEPT B
		1	1	1	
51.	Rel. Prop. 3.352	#50	PROP	finally	

#116 Protozoa

Kinds of Protozoa

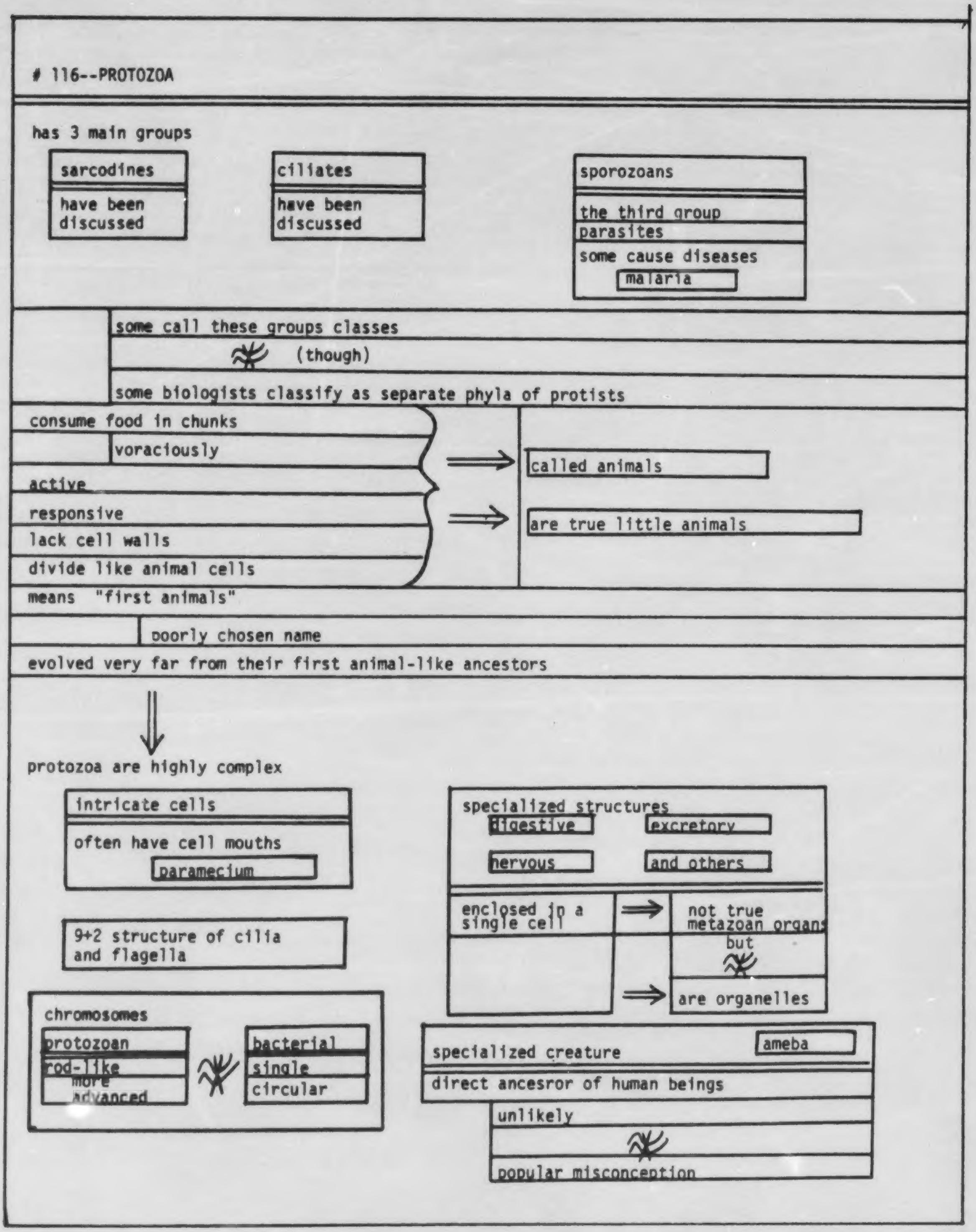
There are three main groups of protozoa. We have discussed the sarcodines and the ciliates. Sporozoans, the third group are all parasites. Malaria is one of the diseases caused by members of this group. We may call these groups classes, though some biologists prefer to classify the three groups as separate phyla of protists.

Why are the protozoa called animals? They voraciously consume their food in chunks. They are active and responsive. They lack cell walls. They divide like animal cells. In short, they are true little animals.

Although the term protozoa means first animals this name is poorly chosen. Protozoa are so complex that they have unquestionably evolved very far from their first animal-like ancestors. Their intricate cells often have cell mouths, as we have seen in paramecium.

Digestive, excretory, nervous, and other specialized structures may be present. These protozoan structures are enclosed within a single cell membrane. Hence they are not true metazoan organs but are orgenelles.

Protozoan complexity is also shown in the 9 + 2 structure of their cilia and flagella, and in their rodlike chromosomes--more advanced than the single, circular chromosome found in bacteria. It is unlikely that a specialized creature such as ameba is the direct ancestor of human beings, though this misconception is popular.



# 116--PROTOZOA

has 3 main groups

sarcodines
have been discussed

ciliates
have been discussed

sporozoans
the third group
parasites
some cause diseases
malaria

some call these groups classes
✳ (though)
some biologists classify as separate phyla of protists

consume food in chunks
voraciously
active
responsive
lack cell walls
divide like animal cells

⇒ called animals
⇒ are true little animals

means "first animals"
poorly chosen name
evolved very far from their first animal-like ancestors

⇓

protozoa are highly complex

intricate cells
often have cell mouths
paramecium

9+2 structure of cilia and flagella

chromosomes
protozoan
rod-like
more advanced
✳
bacterial
single
circular

specialized structures
digestive
excretory
nervous
and others

enclosed in a single cell ⇒ not true metazoan organs
but
✳
⇒ are organelles

specialized creature
ameba
direct ancesror of human beings
unlikely
✳
popular misconception

#116: PROTOZOA

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	1 protozoa	1 PROP	1 has 3 main groups
2.	1.23	1 main groups	1 EXAMP	1 sarcodines
3.	1.232	1 sarcodines	1 PROP	1 have been discussed
4.	1.23	1 main gorups	1 EXAMP	1 ciliates
5.	1.232	1 ciliates	1 PROP	1 have been discussed
6.	1.23	1 main groups	1 EXAMP	1 sporozoans
7.	1.232	1 sporozoans	1 PROP	1 the third group of protozoa
8.	1.232	1 sporozoans	1 PROP	1 parasites
9.	1.232	1 sporozoans	1 PROP	0 some cause diseases
10.	1.2323	1 diseases	1 EXAMP	1 malaria
11.	1.22	1 main groups	1 PROP	1 some call these groups classes
12.	1.22	1 main groups	1 PROP	1 some biologists classify as separated phyla of protists
13.	1.225	1 some call these groups classes	1 NOT SIM	1 some biologists classify as separated phyla of protists
14.	1.2	1 protozoa	1 PROP	1 consume food in chunks
15.	1.22	1 consume food in chunks	1 PROP	1 voraciously

#116: PROTOZOA

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
16.	1.2	protozoa	PROP	active
		1	1	1
17.	1.2	protozoa	PROP	responsive
		1	1	1
18.	1.2	protozoa	PROP	lack cell walls
		1	1	1
19.	1.2	protozoa	PROP	divide like animal cells
		1	1	1
20.	1.27	Rel. Prop. #14, 15, 16, 17, 18, 19, 21	CAUS	called animals
		1	1	1
21.	1.27	Rel. Prop. #14, 15, 16, 17, 18, 19	CAUS	are true little animals
		1	1	1
22.	1.2	protozoa	PROP	called animals
		1	1	1
23.	1.2	protozoa	PROP	are true little animals
		1	1	1
24.	1.2	protozoa	PROP	means "first animals"
		1	1	1
25.	1.22	"first animals"	PROP	poorly chosen name
		1	1	1
26.	1.2	protozoa	PROP	evolved very far from their first animal-like ancestors
		1	1	1
27.	1.2	protozoa	PROP	highly complex
		1	0	1
28.	1.27	"evolution"	CAUS	highly complex
		1	0	1
29.	1.23	highly complex	EXAMP	intricate cells
		1	1	1
30.	1.232	intricate cells	PROP	often have cell mouths

#116: PROTOZOA

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
31.	1.2323	1 often have cells mouths	1 EXAMP	1 paramecium
32.	1.23	1 highly complex	0 EXAMP	1 specialized structures
33.	1.233	1 specialized structures	1 EXAMP	1 digestive
34.	1.233	1 specialized structures	1 EXAMP	1 nervous
35.	1.233	1 specialized structures	1 EXAMP	1 excretory
36.	1.233	1 specialized structures	1 EXAMP	1 and others
37.	1.232	1 specialized structures	1 PROP	1 enclosed in single cell
38.	1.232	1 specialized structures	1 PROP	1 are not true metozoan organs
39.	1.232	1 specialized structures	1 PROP	1 are organelles
40.	1.2327	1 enclosed in a single cell	1 CAUS	1 are not true metozoan organs
41.	1.2327	1 enclosed in a single cell	1 CAUS	1 are organelles
42.	1.2325	1 not true metozoan organs	1 NOT SIM	1 are organelles
43.	1.23	1 highly complex	0 EXAMP	1 9+2 structure of cilia & flagella
44.	1.23	1 highly complex	0 EXAMP	1 chromosomes
45.	1.233	1 chromosomes	0 EXAMP	1 protozoan

#116: PROTOZOA

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
46.	1.232	1 protozoan chromosomes	1 PROP	1 rod-like
47.	1.2322	1 rod-like	1 PROP	1 more advanced
48.	1.233	1 chromosomes	0 EXAMP	1 bacterial
49.	1.232	1 bacterial chromosomes	1 PROP	1 single
50.	1.232	1 bacterial chromosomes	1 PROP	1 circular
51.	1.2325	1 protozoan chromosomes	1 NOT SIM	1 bacterial chromosomes
52.	1.23225	1 rod-like chromosomes	1 NOT SIM	1 bacterial chromosomes
53.	1.23225	1 rod-like chromosomes	1 NOT SIM	1 single chromosomes
54.	1.23225	1 rod-like chromosomes	1 NOT SIM	1 circular chromosomes
55.	1.23	1 highly complex	0 EXAMP	1 specialized creature
56.	1.233	1 specialized creature	1 EXAMP	1 ameba
57.	1.232	1 specialized creature	1 PROP	1 direct ancestor of human beings
58.	1.2322	1 Rel. Prop. #57	1 PROP	1 unlikely
59.	1.2322	1 Rel Prop. #57	1 PROP	1 popular misconception
60.	1.23225	1 unlikely	1 NOT SIM	1 popular misconception

#217 Chief Arguments For and Against Slavery

For and Against Slavery

Malachy Postlethwayt and Thomas Paine had presented the chief arguments for and against slavery. The arguments did not change much in the next hundred years. Those who defended slavery spoke of the money it could make for the slaveowners. They said that there was no other way to work the farms and plantations of the South. They insisted that slaves were property, and that no man could take away another's property. Their slaves, they said, were better off than they had been in Africa. Finally, they turned to religion. Were they not making Christians of their slaves? The souls of these black men, women and children would be saved no matter what happened to their bodies on earth.

The attack against slavery followed the ideas of such men as Thomas Paine. No man had the right to own another man. It was evil to make money from slavery. It was wrong to say that a slave was just another kind of property. No human being could be property. It mattered little how well a master treated his slave. The slave still had a right to his freedom, as all men do. And talk of helping slaves by making them Christians was nonsense. What Christian would try to save a soul by destroying a life?

#217--CHIEF ARGUMENTS FOR AND AGAINST SLAVERY

arguments did not change much for next 100 years

presented by Malachy Postlethwayt and Thomas Paine

arguments for slavery	≠	arguments against slavery
Malachy Postlethwayt		followed ideas of such men as Thomas Paine
make money for slaveowners no other way to work farms and plantations of the South	≠	evil to make money from slaves
slaves were property property couldn't be taken away	≠	no human being could be property ≈ no man had the right to own another man it was wrong to say that a slave was just another kind of property
slaves were better off than they had been in Africa	≠	slaves still had a right to freedom ≈ as all men do mattered little how well a master treated his slave
Religion converting slaves to Christianity souls of Black men, women, and children would be saved no matter what happened to their bodies on earth	≠	talk of helping slaves by making them Christians was nonsense no Christian would try to save a soul by destroying a life

#217: "ARGUMENTS FOR AND AGAINST SLAVERY"

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	1 chief arguments for and against slavery	1 PROP	1 arguments did not change much for next 100 years
2.	1.2	1 chief arguments for and against slavery	1 PROP	1 presented by Malachy Postlethwayt & Thomas Paine
3.	1.2	1 chief arguments for and against slavery	0 PROP	1 arguments for slavery
4.	2.2	1 arguments for slavery	0 PROP	1 Malachy Postlethwayt
5.	1.2	1 chief arguments for and against slavery	0 PROP	1 arguments against slavery
6.	3.2	1 arguments against slavery	1 PROP	1 followed ideas of such men
7.	3.23	1 followed ideas of such men	1 EXAMP	1 Thomas Paine
8.	2.3	1 arguments for slavery	0 EXAMP	1 make money for slaveowners
9.	2.32	1 make money for slaveowners	0 PROP	1 no other way to work farms & plantations of the South
10.	3.3	1 arguments aginst slavery	0 EXAMP	1 evil to make money from slaves
11.	2.35	1 make money for slaveowners	0 NOT SIM	1 evil to make money from slaves
12.	2.3	1 arguments for slavery	0 EXAMP	1 slaves were property
13.	2.32	1 slaves were property	1 PROP	1 property couldn't be taken away
14.	3.3	1 arguments against slavery	0 EXAMP	1 no human being could be property

#217: "ARGUMENTS FOR AND AGAINST SLAVERY"

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
15.	3.3	1 arguments against slavery	0 EXAMP	1 no man had the right to own another man
16.	3.34	1 no human being could be poperty	0 SIM	1 no man had the right to own another man
17.	3.343	1 Rel. Prop. #16	0 EXAMP	1 it was wrong to say that a slave was just another kind of property
18.	2.35	1 slaves were property	0 NOT SIM	1 no human being could be property
19.	2.3	1 arguments for slavery	0 EXAMP	1 slaves were better off than they had been in Africa
20.	3.3	1 arguments against slavery	0 EXAMP	1 slaves still had a right to freedom, as do all men
21.	3.34	1 slaves still had a right to freedom	1 SIM	1 as do all men
22.	3.342	1 slaves still had a right to freedom, as do all men	0 PROP	1 mattered little how well a master treated a slave
23.	2.35	1 slaves were better off than they had been in Africa	1 NOT SIM	1 slaves still had the right to freedom, as do all men
24.	2.3	1 arguments for slavery	1 EXAMP	1 (turned to) Religion
25.	2.32	1 religion	1 PROP	1 converting slaves to Christianity
26.	2.32	1 religion	1 PROP	1 souls of Black men, women, children would be saved
27.	2.322	1 souls of Black men, women, & children would be saved	1 PROP	1 no matter what happened to their bodies on earth

#217: "ARGUMENTS FOR AND AGAINST SLAVERY"

#	embeddedness	CONCEPT A	RELATIONSHIP	CONCEPT B
28.	3.3	1 arguments against slavery	1 EXAMP	1 talk of helping slaves by making them Christians was nonsense
29.	3.32	1 talk of helping slaves by making them Christians was nonsense	0 PROP	1 no Christian would try to save a soul by destroying a life
30.	2.325	1 converting slaves to Christianity	1 NOT SIM	1 talk of helping slaves by making them Christians was nonsense
31.	2.5	1 arguments for slavery	0 NOT SIM	1 arguments against slavery

#218 Why Blacks Had Little Hope in 1857

A Time of Despair

In 1857 black Americans had little hope. Slavery was stronger than ever in the South. There was little equility in the North. In most places white people could not forget that each forget that each freedman had once been a slave. Most white people could not rid themselves of the feeling that any white person was somehow better than any black. There were few places where a black man could hope to vote, find a good job or give his children an education equal to that received by white boys and girls.

Life was worse in the South. The slaveowners who ruled there used their power to make certain that black people were never given equal rights. Meanwhile, the United States was growing. New states were forming in the West. Southern leaders, helped by many politicians in the North, worked to spread slavery to these new states. Stephen Douglas, Senator from Illinois, said slavery should be allowed in any new state whose white citizens wanted it! In 1854 Congress had passed the Kansas-Nebraska Act, which seemed to open a great new area to slavery. The whole country was waiting for the Supreme Court's decision in the Dred Scott case. It would decide many questions at the same time.

#218--WHY BLACKS HAD LITTLE HOPE IN 1857

Life in the north
- white people could not forget that each freedman had once been a slave ⇒
- most white people could not rid themselves of feelings of superiority ⇒
- little equality
  - there were few places where a black man could hope to vote
  - there were few places where a black man could hope to find a good job
  - there were few places where a black man could hope to give his children an educ
    - equal to that of white children

Life in the south
- was worse than in the north
- slavery was stronger than ever
  - slave owners were powerful
    - slaveowners ruled ⇓ Black people never given equal rights

growing United States
- new states were forming
  - in the West
- allowed for the spread of slavery
  - Southern leaders worked to spread slavery to the new states
    - helped by Northern politicians
      - Stephen Douglas
        - Illinois senator
        - said slavery should be allowed in any new state where white citizens wanted it
  - Kansas-Nebraska Act
    - passed by Congress
    - passed in 1854
    - seemed to open a great new area to slavery

whole country was waiting for Dred Scott decision
- would be decided by Supreme Court
- would decide many questions at the same time

#218: A TIME OF DESPAIR

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.3	0 why Blacks had little hope in 1857	0 EXAMP	0 life in the North
2.	1.3	0 why Blacks had little hope in 1857	0 EXAMP	1 life in the South
3.	2.5	0 life in the North	1 NOT SIM	1 life in the South
4.	2.2	0 life in the North	1 PROP	1 white people could not forget that each freedman had once been a slave
5.	2.2	0 life in the North	1 PROP	1 most white people could not rid themselves of feelings of superiority
6.	2.2	0 life in the North	1 PROP	1 little equality
7.	2.27	1 white people could not forget that each feedman had once been a slave	0 CAUS	1 little equality
8.	2.27	1 most white people could not rid themselves of feelings of superiority	0 CAUS	1 little equality
9.	2.273	1 little equality	0 EXAMP	1 there were few places where a black man could hope to vote
10.	2.273	1 little equality	0 EXAMP	1 there were few places where a black man could hope to find a good job
11.	2.273	1 little equality	0 EXAMP	1 there were few places where a black man could hope to give his children an education
12.	2.2732	1 education	1 PROP	1 equal to that of white children

#218: A TIME OF DESPAIR

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
13.	3.2	1 life in the South	1 PROP	0 was worse than in the North
14.	3.2	1 life in the South	1 PROP	1 slavery was stronger than ever
15.	3.22	1 slavery was stronger than ever	0 PROP	1 slaveowners were powerful
16.	3.22	1 slavery was stronger than ever	0 PROP	1 Rel. Prop. #17
17.	2.227	1 slaveowners ruled	1 CAUS	1 black people never given equal rights
18.	1.3	0 why Blacks had little hope in 1857	0 EXAMP	1 growing United States
19.	4.2	1 growing United States	1 PROP	1 new states were forming
20.	4.22	1 new states were forming	1 PROP	1 in the West
21.	4.2	1 growing United States	0 PROP	0 allowed for the spread of slavery
22.	4.23	0 allowed for the spread of slavery	0 EXAMP	1 southern leaders worked to spread slavery to the New States
23.	4.232	1 southern leaders worked to spread slavery to the New States	1 PROP	1 helped by Northern politicians
24.	4.2323	1 Northern politicians	0 EXAMP	1 Stephen Douglas
25.	4.23232	1 Stephen Douglas	1 PROP	1 Illinois Senator

#218: A TIME OF DESPAIR

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
26.	4.23232	Stephen Douglas	PROP	said slavery should be allowed in any new state where white citizens wanted
		0	0	1
27.		allowed for the spread of slavery	EXAMP	Kansas-Nebraska Act
		1	1	1
28.	4.232	Kansas-Nebraska Act	PROP	passed by Congress
		1	1	1
29.	4.232	Kansas-Nebraska Act	PROP	passed in 1854
		1	1	1
30.	4.232	Kansas-Nebraska Act	PROP	seemed to open a great new area to slavery
		0	0	1
31.	1.2	why Blacks had little hope in 1857	PROP	whole country was waiting for Dred Scott Decision
		1	1	1
32.	1.22	Dred Scott decision	PROP	would be decided by Supreme Court
		1	1	1
33.	1.22	Dred Scott decision	PROP	would decide many questions at the same time

#219 Western Cattle Industry in 1980's

Ranches and fences

By the 1980's the western cattle industry centered in the high plains running through eastern Montana, Wyoming, Colorado, the New Mexico Territory, and western Texas. Most ranchers by now owned their grazing land and fenced it in with barbed wire.

Ranches varied in size from about 2,000 to 100,000 acres (about 800 to 40,500 hectares). To an easterner, accustomed to small farms of a few hundred acres at most, western ranches seemed enormous. But the ranches had to be large since each steer required a grazing area of 15 to 75 acres (or about 6 to 30 hectares), depending upon the amount of rainfall and the resulting growth of grass.

With the invention of better instruments for drilling into the ground and the improvement of windmills for pumping water, many cattle raisers watered their stock from wells scattered over their ranches. In years of abundant rainfall, cattle ranches might prosper, since their herds could fatten on the natural grasses. But in years of drought they were forced to feed their cattle hay or cottonseed cake, a costly practice which often wiped out their profits.

#219--CATTLE INDUSTRY BY 1890's

centered in high plains

running through Eastern Montana

running through West Texas

running through Wyoming

running through New Mexico Territory

running through Colorado

most ranchers owned their grazing land by now

most ranchers fenced in land with barbed wire

each steer required a grazing area ⇒ ranches to be (are) large

15 to 75 acres ≈ 6 to 35 hectares

depends upon amount of rain ⇒ growth of grass

varied from about 2000 to 10,000 acres ≈ 800 to 4500 hectares

western ranches seemed enormous to easterners ⋇ easterners accustomed to small farms of a few hundre acres at most

influence of availability of water

invention of better instruments for drilling into the ground
improvement of windmills for pumping water
⇒ many cattle raisers watered their stock from wells scattered over the ranch

years of abundant rainfall ⇒ natural grasses ⇒ herds would fatten ⇒ ranches might prosper

⋇

years of drought ⇒ no natural grass ⇒ forced to feed cattle hay or cotton-seed cake — a costly practice ⇒ wiped out their profits

#219: RANCHES AND FENCES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	1 Western cattle industry to 1890's	1 PROP	1 centered in high plains
2.	2.3	1 high plains	0 EXAMP	1 running thru Eastern Montana
3.	2.3	1 high plains	0 EXAMP	1 running thru Wyoming
4.	2.3	1 high plains	0 EXAMP	1 running thru Colorado
5.	2.3	1 high plains	0 EXAMP	1 running thru West Texas
6.	2.3	1 high plains	0 EXAMP	1 running thru New Mexico Territory
7.	1.2	1 Western cattle industry by 1890's	1 PROP	1 most ranchers owned their grazing land by now
8.	3.2	1 most ranchers owned their grazing land by now	1 PROP	1 most ranchers fenced in land with barbed wire
9.	1.2	1 Western cattle industry by 1890's	0 PROP	1 each steer required a grazing area causes ranches to be large (#10)
10.	4.7	1 each steer required a grazing area	1 CAUS	1 ranches to be (are) large
11.	4.2	1 grazing area	1 PROP	1 15 to 75 acres
12.	4.24	1 15 to 75 acres	1 SIM	1 6 to 30 hectares
13.	4.2	1 grazing area	1 PROP	1 depends upon amount of rain
14.	4.27	1 depends upon amount of rain	1 CAUS	1 growth of grass

#219: RANCHES AND FENCES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
15.	4.72	1 ranches to be (are) large	1 PROP	1 Western ranches seemed enormous to easterners
16.	4.724	1 2000 to 100,000 acres	1 SIM	1 800 to 4500 hectares
17.	4.722	1 ranches to be (are) large	1 PROP	1 Western ranches seemed enormous to easterners
18.	4.7225	1 Western ranches seemed enormous to easterners	0 NOT SIM	1 easterners accustomed to small farms
19.	4.72252	1 easterners accustomed to small farms	1 PROP	1 of a few hundred acres at most
20.	1.2	1 Western cattle industry by 1890's	0 PROP	0 influence of availability of water
21.	5.3	0 influence of availability of water	0 EXAMP	1 Rel. Prop. #22,23
22.	5.37	1 invention of better instruments for drilling into the ground	0 CAUS	1 many cattle raisers watered their stock from wells
23.	5.37	1 improvement of windmills for pumping water	0 CAUS	1 many cattle raisers watered their stock from wells
24.	5.372	1 wells	1 PROP	1 scattered all over the ranch
25.		0 influence of availability of water	0 EXAMP	1 Rel. Prop. #26, 27, 28
26.	5.37	1 years of abundant rainfall	0 CAUS	1 natural grasses
27.	5.377	1 natural grasses	1 CAUS	1 herd would fatten

#219: RANCHES AND FENCES

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
28.	5.3777	1 herds would fatten	1 CAUS	1 ranchers might prosper
29.	5.3	0 influence of availability of water	0 EXAMP	1 Rel. Prop. #30, 31, 32
30.	5.37	1 years of drought	0 CAUS	0 no natural grasses
31.	5.377	0 no natural grasses	0 CAUS	1 forced to feed cattle hay or cottonseed cake
32.	5.3777	1 forced to feed hay or cottonseed cake	1 CAUS	1 wiped out their profits
33.	5.3772	1 forced to feed hay or cottonseed cake	1 PROP	1 a costly practice
34.	5.35	1 Rel. Prop. #26, 27, 28	1 NOT SIM	1 Rel. Prop. #30, 31, 32

#220 Sherman Antitrust Act

The Sherman Antitrust Act

Finally, in 1890, during the administration of President Benjamin Harrison, Congress passed the Sherman Antitrust Act. The public assumed that the act was intended to restore a larger measure of free competition by breaking up giant "trusts"--a term that had come to mean any monopoly or near-monopoly of an industry. This also seemed to be what Congress intended, for Section 1 of the act declared: "Every contract, combination in the form of trust or otherwise, a conspiracy, in restraint of trade or commerce among the several states or with foreign nations is hereby declaired to be illegal . . ." The act further stated that individuals and corporations found guilty of violating the law would be liable to legal penalties.

Weakness of the Sherman Antitrust Act

Actually, few Americans, including even corporation lawyers and members of Congress, understood precisely what the new law did and did not prohibit. The act failed to define such words as "trust," "combination," "conspiracy," and "monopoly."

Because of its loose wording, the Sherman Antitrust Act was extremely difficulty to enforce. The government lost seven out of the first eight cases that it brought against giant business combinations, or trusts.

In 1895, the Supreme Court handed down a decision in the case of U.S. v. E.C. Knight Company that made the antitrust law almost meaningless. The Court ruled that the company, which had secured control of 98 percent of the sugar refining business, was not guilt of violating the antitrust law because its control of the refining process alone did not involve restraint of interstate trade. A monopoly itself was not illegal, the Court stated. It became illegal only when it served to restrain interstate trade.

#220--SHERMAN ANTITRUST ACT

finally passed in 1890

passed during Benjamin Harrison's administration

passed by Congress

what public assumed the act was about

break up giant "trusts" ⇒ restore larger measure of free competition

DEF: a term that had come to mean a monopoly or near-monopoly of a business

≈

what Congress intended (by the Act)

Section 1 of the Act

"Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several states or with foreign nations is here by declared to be illegal."

stated that individuals and corporations found guilty of violating the law would be liable to legal penalties

had weaknesses

few Americans understood precisely what the new law did and did not prohibit

included corporation lawyers

included members of Congress

The act failed to define words

trust

combination

conspiracy

monopoly

⇒ loose wording ⇒ Act was extremely difficult to enforce →

government lost seven out of first eight cases

brought against giant business combinations

≈ (or)

trusts

→ Supreme Court decision ⇒ law became almost worthless

in 1895

involved U.S. vs. E.C. Knight Company

Company had secured control of 98% of the sugar refining business

Company's control over refining didn't restrain interstate trade ⇒ Company to be found not guilty

a monopoly itself was not illegal

✱ (but)

monopolies are illegal only when they restrained interstate trade

#220: SHERMAN ANTITRUST ACT

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
1.	1.2	Sherman Antitrust Act	PROP	finally passed in 1890
		1	1	1
2.	1.2	Sherman Antitrust Act	PROP	passed during Benjamin Harrison's administration
		1	1	1
3.	1.2	Sherman Antitrust Act	PROP	passed by Congress
		1	1	1
4.	1.2	Sherman Antitrust Act	PROP	what public assumed the act was about
		1	0	1
5.	2.3	what public assumed the act was about	EXAMP	break up giant trusts causes restore larger measure of free competition (6)
		1	1	1
6.	2.37	break up giant trusts	CAUS	restore larger measure of free competition
		1	1	1
7.	2.31	trusts	DEF	a term that had come to mean a monopoly or near monopoly of a business
		1	1	1
8.	1.2	Sherman Antitrust Act	PROP	what Congress intended (by the act)
		1	0	1
9.	3.3	what Congress intended (by the act)	EXAMP	Section 1 of the Act
		1	1	1
10.	3.32	Section 1 of the Act	PROP	"every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several states or with foreign nations is hereby declared to be illegal."
		1	1	1
11.	2.34	what the public assumed the act was about	SIM	what Congress intended (by the Act)
		1	0	1
12.	3.33	what Congress intended (by the Act)	EXAMP	act states that individuals and corporations found guilty of violating the law would be liable to legal penalties

#220: SHERMAN ANTITRUST ACT

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
13.	1.2	1 Sherman Antitrust Act	1 PROP	1 had weaknesses
14.	4.3	1 had weaknesses	0 EXAMP	1 few Americans understood precisely what the new law did and did not prohibit
15.	4.32	1 few Americans understood precisely what the new law did and did not prohibit	1 PROP	1 included corporation lawyers
16.	4.32	1 few Americans understood precisely what the new law did nad did not prohibit	1 PROP	1 included members of Congress
17.	4.3	1 had weaknesses	0 EXAMP	1 the act failed to define words
18.	4.33	1 words	1 EXAMP	1 trust
19.	4.33	1 words	1 EXAMP	1 combination
20.	4.33	1 words	1 EXAMP	1 conspiracy
21.	4.33	1 words	1 EXAMP	1 monopoly
22.	4.3	1 had weaknesses	0 EXAMP	1 loose wording
23.	4.3	1 had weaknesses	0 EXAMP	1 act was extremely difficult to enforce
24.	4.3	1 had weaknesses	0 EXAMP	1 Supreme Court decision
25.	4.3	1 had weaknesses	0 EXAMP	1 law became almost meaningless
26.	4.37	1 the act failed to define words	0 CAUS	1 loose wording

#220: SHERMAN ANTITRUST ACT

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
27.	4.377	1 loose wording	1 CAUS	1 act was extremely difficult to enforce
28.	4.3773	1 act was extemely difficult to enforce	0 EXAMP	1 government lost 7 out of first 8 cases
29.	4.37732	1 government lost 7 out of first 8 cases	1 PROP	1 brought against giant business combination
30.	4.377324	1 brought against giant business combinations	1 SIM	1 trusts
31.	4.3776	1 act was extremely difficult to enforce	0 TEMP	1 Supreme Court decision
32.	4.37762	1 Supreme Court decision	1 PROP	1 was in 1895
33.	4.37762	1 Supreme Court decision	1 PROP	1 involved US vs E.C. Knight Company
34.	4.377622	1 involved US vs E.C. Knight Company	1 PROP	1 company had secured control of 98% of sugar refining business
35.	4.37762	1 Supreme Court decision	1 PROP	1 Rel. Prop. #36
36.	4.377627	1 company's control over refining interstate trade	1 CAUS	1 company to be found not guilty
37.	4.37762	1 Supreme Court decision	1 PROP	1 a monopoly itself is not illegal
38.	4.377625	1 a monopoly itself was not illegal	1 NOT SIM	1 monopolies are illegal only when they restrained interstate trade
39.	4.37762	Supreme Court decision	PROP	monopolies are illegal only when they restrained interstate trade
40.	4.37767	1 Supreme Court decision	1 CAUS	1 law became almost meaningless

#221 Corporations

Corporations

As industries grew larger in the 1800's, another form of business organization, the corporation, became more common. It gradually became the leading form of business organization in the United States.

To start a corporation, three or more persons must apply to a state legislature for a charter, or license, to start a specific business enterprise. Once granted, this charter allows the interested persons to organize a corporation and sell shares of stock, or certificates of ownership, to raise the capital needed to carry on the enterprise. The stockholders or shareholders--those who invest their money in the enterprise--may periodically receive dividends, that is, a share of the corporation's profits. Legally, a corporation is regarded as an individual--an "artificial person" entirely separate from its owners--possessing certain rights, such as the right to make contracts, to buy and sell property, and to sue and be sued in court.

The corporation has important advantages over the individual proprietorship and the partnership. Two advantages are especially important to the corporation itself. First, the corporation can draw upon very large supplies of capital because it can sell shares of stock to many people. Second, the charter gives the corporation "perpetual life"; that is, the corporation is not ended by the death or resignation of one or several of its owners.

#221--CORPORATIONS

another form of business organization

as industries grew larger → corporations became more common in 1800's → gradually became the leading form of business organization

procedure to start a corporation

- must apply for a charter
  - ≈ a license
  - to start a specific business enterprise
  - apply to state legislature
  - 3 or more people must apply

→ charter granted → interested person can organize a corporation

- interested persons can sell stock ⇒ raise capital necessary to carry on the enterprise
  - DEF: certificates of ownership
  - sold to stockholders or share holders
    - DEF: those who invest money in the enterprise
    - periodically receive dividends
      - DEF: a share of corporate profits

have legal status

- corporation is regarded as an individual
  - DEF: an "artificial person" entirely separate from its owners
  - possesses certain rights
    - make contracts
    - buy property
    - sell property
    - sue in court
    - be sued in court

Have important advantages (over) ✳
- individual proprietorship
- partnership

two advantages are especially important to the corporation itself

sells shares of stock to many people ⇒ can draw upon large supplies of capital

charter gives the corporation "perpetual life"

DEF: corporation is not ended by death or resignation of one or several of its owners

#221: CORPORATIONS

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
1.	1.2	corporations	PROP	another form of business organization
		1	1	1
2.	1.2	corporations	PROP	Rel. Prop. #3, 4
		1	1	1
3.	1.26	as industries grew large	PREC	corporations became more common in 1800's
		1	1	1
4.	1.266	corporations became more common in 1800's	PREC	gradually became the leading form of business organization
		1	1	0
5.	1.2	corporations	PROP	procedure to start a corporation
		0	1	1
6.	1.22	procedure to start a company	PROP	Rel. Prop. #11, 12, 13
		1	1	1
7.	2.4	must apply for a charter	SIM	license
		1	1	1
8.	2.2	must apply for a charter	PROP	to start a specific business enterprise
		1	1	1
9.	2.2	must apply for a charter	PROP	apply to state legislature
		1	1	1
10.	2.2	must apply for a charter	PROP	3 or more people must apply
		1	1	1
11.	2.6	must apply for a charter	PREC	charter granted
		1	1	1
12.	2.66	charter granted	PREC	interested persons can organize corporation
		1	1	1
13.	2.66	charter granted	PREC	interested persons can sell shares of stock
		1	0	1
14.	2.661	stock	DEF	certificate of ownership
		1	0	1
15.	2.662	stock	PROP	sold to stockholders or shareholders

#221: CORPORATIONS

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
16.	2.6621	1 stockholders or shareholders	1 DEF	1 those who invest money in the enterprise
17.	2.6622	1 stockholders or shareholders	1 PROP	1 periodically receive dividends
18.	2.66221	1 dividends	1 DEF	1 a share of corporate profits
19.	2.667	1 interested persons can sell shares of stock	1 CAUS	1 raise capital necessary to carry on the enterprise
20.	1.2	1 corporations	1 PROP	1 have legal status
21.	1.32	0 have legal status	1 PROP	1 corporation is regarded as an individual
22.	3.21	1 corporation regarded as an individual	1 DEF	1 an "artificial person" entirely separate from its owner
23.	1.322	1 corporation regarded as an individual	1 PROP	1 possesses certain rights
24.	1.3223	1 certain rights	1 EXAMP	1 make contracts
25.	3.223	1 certain rights	1 EXAMP	1 buy property
26.	3.223	1 certain rights	1 EXAMP	1 sell property
27.	3.223	1 certain rights	1 EXAMP	1 sue in court
28.	3.223	1 certain rights	1 EXAMP	1 be sued in court
29.	1.2	1 corporations	1 PROP	1 Rel. Prop. #30,31

#221: CORPORATIONS

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	0	1
30.	4.5	has important advantages	NOT SIM	individual proprietorship
		1	0	1
31.	4.5	has important advantages	NOT SIM	partnership
		1	1	1
32.	4.52	has important advantages over individual proprietorship AND partnership (#30,31)	PROP	two advantages are especially important to corporation itself
		1	1	1
33.	4.523	two advantages are especially important to corporation itself	EXAMP	Rel. Prop. #34
		1	1	1
34.	4.5237	sells shares of stock to many people	CAUS	can draw upon a large supply of capital
		1	1	1
35.	4.523	two advantages are especially important to corporation itself	EXAMP	charter gives the corporation "perpetual life"
		1	1	1
36.		"perpetual life"	DEF	corporation is not ended by death or resignation of one or several of its owners

#222 John D. Rockefeller

John D. Rockefeller

Even richer than Carnegie was John D. Rockefeller, born in 1839, who started life as a poor boy and accumulated the world's greatest fortune. One of five children, Rockefeller left high school after one year to work as a clerk for about $3 a week. In 1858, at age 19, he went into the wholesale food business. The Civil War brought large profits to the new company. Rockefeller promptly invested his money in oil refineries, and from this point on oil became his major interest. He pioneered in developing the trust as a form of big business organization. Although ruthless in forcing competitors to choose between joining him or going down in ruin, Rockefeller is credited with bringing order and efficiency to the highly chaotic and wasteful oil industry.

By 1900, however, Rockefeller's interests had broadened. He owned controlling stock in the gigantic Standard Oil Company, in railway lines, in steamship lines, in iron ore deposits in Colorado and in the Lake Superior region, in steel mills, and in many other enterprises. When the United States Steel Corporation was being organzied by J.P. Morgan, Rockefeller sold to the newly formed corporation his iron ore deposits and Great Lakes steamers, receiving $80 million for the iron ore deposits alone.

Like Carnegie, Rockerfeller later gave away many millions, and the foundations created with his money today continue to foster research and promote the welfare of the American people.

#222--JOHN D. ROCKEFELLER

richer than Carnegie

started life as a poor boy → accumulated the world's greatest fortune

one of 5 children

born in 1839 → left high school after one year → worked as a clerk

$3 a week → 1858

went into the wholesale food business

19 yrs. old →

→ Civil War brought large profits to the business → invested in oil refineries

from this point on →

→ oil became his major interest

pioneered in developing the trust as a form of big business organization → credited with having brought order and efficiency to the industry

had been highly chaotic and wasteful

but ✳

was ruthless in forcing competitors to join him or go down in ruin

however ✳ →

→ By 1900 →

interests had broadened

owned controlling stock in the Standard Oil Company

a gigantic business

owned controlling stock in railway lines

owned controlling stock in many other enterprises

owned controlling stock in steamship lines → sold Great Lakes steamers

to U.S. Steel corporation

owned controlling stock in iron ore deposits

in Colorado

in Lake Superior region → sold iron ore deposits

for $80 million

to U.S. Steel Corporation

organized by J.P. Morgan

newly formed

→ Rockefeller gave away millions ≈ Carnegie

later (in life)

created foundations

continue today

foster research

promote welfare of American people

#222: JOHN D. ROCKEFELLER

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	1 John D. Rockefeller	1 PROP	1 richer than Carnegie
2.	1.2	1 John D. Rockefeller	1 PROP	1 started life as a poor boy
3.	1.2	1 John D. Rockefeller	1 PROP	1 accumulated the world's greatest fortune
4.	1.26	1 started life as a poor boy	0 PREC	1 accumulated the world's greatest fortune
5.	1.2	1 John D. Rockefeller	1 PROP	1 one of 5 children
6.	1.2	1 John D. Rockefeller	1 PROP	1 born in 1839
7.	1.26	1 born in 1839	0 PREC	1 left high school after one year
8.	1.266	1 left high school after one year	1 PREC	1 worked as a clerk
9.	1.2662	1 worked as a clerk	1 PROP	1 paid about $3 a week
10.	1.2666	1 worked as a clerk	0 PREC	1 1858
11.	1.26662	1 1858	1 PROP	1 went into the wholesale food business
12.	1.26662	1 1858	1 PROP	1 Rockefeller was 19 years old
13.	1.26662	1 1858	0 PREC	1 Civil War brought large profits to the business
14.	1.266626	1 Civil War brought large profits to the business	0 PREC	1 invested in oil refineries
15.	1.2666266	1 invested in oil refineries	1 PREC	1 oil became his major interest

#222: JOHN D. ROCKEFELLER

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
		1	0	1
16.	2.2	oil became his major interest	PROP	pioneered in developing trust as a form of big business organization
		1	0	1
17.	2.2	oil became his major interest	PROP	brought order and efficiency to the industry
		1	0	1
18.	2.26	pioneered in developing trust as a form of big business organization	PREC	brought order and efficiency to the industry
		1	1	1
19.	2.265	credited with having brought order and efficiency to the industry	CON	ruthless in forcing competitors to join him or go down in ruin
		1	1	1
20.	2.22	industry	PROP	had been highly chaotic and wasteful
		1	1	1
21.	2.6	oil became his major interest	PREC	by 1900
		1	1	1
22.	2.5	oil became his major interest	CON	Rel. Prop. #23
		1	1	1
23.	3.2	by 1900	PROP	interests had broadened
		1	0	1
24.	3.23	interests had broadened	EXAMP	owned controlling stock in the Standard Oil Co.
		1	1	1
25.	3.232	Standard Oil Co.	PROP	a gigantic business
		1	0	1
26.	3.23	interests had broadened	EXAMP	owned controlling stock in railway lines
		1	0	1
27.		interests had broadened	EXAMP	owned controlling stock in many other enterprises

#222: JOHN D. ROCKEFELLER

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
28.	3.23	1 interests had broadened	0 EXAMP	1 owned controlling stock in steamship lines
29.	3.236	1 owned controlling stock in steamship lines	0 PREC	1 sold Great Lakes steamers
30.	3.2362	1 sold Great Lakes steamers	1 PROP	1 to U.S. Steel Corporation
31.	3.23	1 interests had broadened	0 EXAMP	1 owned controlling stock in iron ore deposits
32.	3.232	1 iron ore deposits	1 PROP	1 in Colorado
33.	3.232	1 iron ore deposits	1 PROP	1 in Lake Superior region
34.	3.236	1 owned controlling stock in iron ore depositis	0 PREC	1 sold iron ore deposits
35.	3.2362	1 sold iron ore deposits	1 PROP	1 for $80 million
36.	3.2362	1 sold iron ore deposits	1 PROP	1 to U.S. Steel Corporation
37.	3.23622	1 U.S. Steel Corp.	1 PROP	1 organized by J.P. Morgan
38.	3.23622	1 U.S. Steel Corp.	1 PROP	1 newly formed
39.	3.6	1 By 1900	1 PREC	1 Rockefeller gave away millions
40.	4.4	1 Rockefeller gave away millions	1 SIM	1 Carnegie
41.	4.2	1 Rockefeller gave away millions	1 PROP	1 later

#222: JOHN D. ROCKEFELLER

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
42.	4.2	Rockefeller gave away millions	PROP	created foundation
		1	1	1
43.	4.22	foundations	PROP	continue today
		1	1	1
44.	4.22	foundations	PROP	foster research
		1	1	1
45.	4.22	foundations	PROP	promote welfare of American people

#223 The New Deal Farm Program

Dust Bowl

The new deal had to cope with a terrible disaster that struck the Great Plains in 1934 and 1935. During World War I, prices had tempted farmers to grow wheat and cotton in the former grazing lands west of 98° longitude. Plows and harrows broke up the deep, tough sod that had previously prevented erosion and conserved moisture in this semi-arid region. When the years 1933-1935 proved unusually dry, there was danger that the region would become a desert. Terrible dust storms carried away topsoil in such quantities that even on the Atlantic seaboard the sun was obscured by a yellow haze. The water table of parts of the Plains region sank so low that deep wells ran dry. Between 1934 and 1939 an estimated 350,000 farmers emigrated from the "dust bowl." To take care of immediate distress, Congress provided funds so that dust bowl farmers could get new seed and livestock. On a long-term basis, the Department of Agriculture dealt with the dust bowl by helping farmers to plant 190 million trees in shelter belts, which cut wind velocity and retained moisture. Farmers were also encouraged to restore the Plains to what they had been in the days of the cattle kingdom and earlier a grazing region.

There was much criticism of the New Deal farm program. Many farmers did not like being told how much they could plant. Deliverately creating scarcity when people were hungry seemed immoral. The benefits of the AAA were unequal. On the whole, though, the New Deal provided more direct assistance to farmers than to any other group in the population. Hundreds of thousands of families were saved from bleak poverty and despair.

#223-- THE NEW DEAL FARM PROGRAM

had to cope with a disaster
- terrible
- struck Great Plains
- struck in 1934 and 1935
- farm practices ⇒ the disaster
  - Great Plains Region
    - before World War I
    - grazing land
      - west of 98longitude
        - see map, page 9
    - had sod
      - deep
      - tough
      - prevented erosion
      - conserved moisture
    - semi-arid region
  - → prices tempted farmers to grow wheat and cotton
    - during World War I
  - → plows and harrows broke up the sod →
  - → years unusually dry
    - in 1933-1935
    - ⇒ danger that region would become desert
  - → dust storms carried away topsoil
    - terrible
    - such quantities carried
      - ⇒ sun obscured
        - even on Atlantic seaboard
        - by yellow haze
  - → water table sank deep wells ran dry
    - affected parts of Plains region
  - ⇒ estimated 350,000 farmers emigrated from the "dust bowl"
    - between 1934 and 1939

Government took care of distress
- immediate
  - Congress provided funds ⇒ dust bowl farmers could get new seed
    dust bowl farmers could get (new) livestock
- long term solution
  - Dept. of Agriculture helped farmers plant trees ⇒ cut wind velocity
    retained moisture
    - 190 million
    - in shelter belts
  - encouraged farmers to restore the Plains to a grazing region
    - what they (the Plains) had been in days of cattle kingdom and earlier

much criticism of the New Deal Farm Program
- many farmers did not like being told how much they could plant
- deliberately creating scarcity when people were hungry seemed immoral
- benefits of the AAA were unequal

✳ (though)

provided more direct assistance to farmers > direct assistance to any other group in the population
- saved hundreds of thousands of families
  - from bleak despair and poverty

#223: DUST BOWL

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	0 The New Deal farm program	1 PROP	1 had to cope with a disaster
2.	2.2	1 disaster	1 PROP	1 terrible
3.	2.2	1 disaster	1 PROP	1 struck the Great Plains
4.	2.2	1 disaster	1 PROP	1 struck in 1934 and 1935
5.	2.2	1 disaster	1 PROP	0 farm practices caused the disaster (6)
6.	2.27	0 farm practices	0 CAUS	0 the disaster
7.	2.22	0 farm practices caused the disaster	0 PROP	0 Rel. Prop. #18, 20, 21, 24, 30
8.	3.2	1 Great Plains region	0 PROP	1 before World War I
9.	3.2	1 Great Plains region	0 PROP	1 grazing land
10.	3.22	1 grazing land	1 PROP	1 west of 98° longitude
11.	3.222	1 west of 98° longitude	1 PROP	1 see map, page 9
12.	3.22	1 grazing land	1 PROP	1 had sod
13.	3.222	1 sod	1 PROP	1 deep
14.	3.222	1 sod	1 PROP	1 tough
15.	3.222	1 sod	1 PROP	1 prevented erosion

#223: DUST BOWL

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
16.	3.222	1 sod	1 PROP	1 converved moisture
17.	3.2	1 Great Plains region	0 PROP	1 semi-arid region
18.	3.2	1 Great Plains region	0 PREC	1 prices tempted farmers to grow wheat and cotton
19.	3.22	1 prices tempted farmers to grow wheat and cotton	1 PROP	1 during WWI
20.	3.26	1 prices tempted farmers to grow wheat and cotton	0 PREC	1 plows and harrows broke up the sod
21.	3.266	1 plows and harrow broke up the sod	1 PREC	1 years unusually dry
22.	3.2662	1 years unusually dry	1 PROP	1 in 1933-1935
23.	3.2667	1 years unusually dry	0 CAUS	1 danger that region would become a desert
24.	3.2666	1 years unusually dry	0 PREC	1 dust storms carried away topsoil
25.	3.26662	1 dust storms carried away topsoil	1 PROP	1 terrible
26.	3.26662	1 dust storms carried away topsoil	1 PROP	1 such quantities carried
27.	3.266627	1 such quantities carried	1 CAUS	1 sun obscured
28.	3.2666272	1 sun obscured	1 PROP	1 even on Atlantic seaboard
29.	3.2666272	1 sun obscured	1 PROP	1 by yellow haze

#223: DUST BOWL

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	0	1
30.	3.2666	years unusually dry	PREC	water table sank causes deep wells to run dry (31)
		1	1	1
31.	3.26667	water table sank	CAUS	deep wells ran dry
		1	1	1
32.	3.26662	water table sank causes deep wells to run dry	PROP	affected parts of Plains region
		0	0	1
33.	3.7	farm practices caused the disaster	CAU	estimated 350,000 farmers emigrated from the "dust bowl"
		1	1	1
34.	3.72	estimated 350,000 farmers emigrated from the dust bowl	PROP	between 1934 and 1939
		0	0	0
35.	1.2	the New Deal farm program	PROP	government took care of distress
		0	1	1
36.	4.2	Government took care of distress	PROP	immediate
		1	1	1
37.	4.22	immediate	PROP	Congress provided funds
		1	1	1
38.	4.227	Congress provided funds	CAUS	dust bowl farmers could get new seed
		1	1	1
39.	4.227	Congress provided funds	CAUS	dust bowl farmers could get (new) livestock
		0	1	1
40.	4.2	Government took care of distress	PROP	long term basis solution
		1	1	1
41.	4.22	long term basis solution	PROP	Department of Agriculture helped farmers plant trees
		1	1	1
42.	4.222	Dept. of Agric. helped farmers plant trees	PROP	190 million (trees)

#223: DUST BOWL

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
43.	4.222	Dept. of Agric. helped farmers plant trees	PROP	in shelter belts
44.	4.227	1 Dept. of Agric. helped farmers plant trees	0 CAUS	1 cut wind velocity
45.	4.227	1 Dept. of Agric. helped farmers plant trees	0 CAUS	1 retained moisture
46.	4.22	1 long term basis solution	1 PROP	1 encouraged farmers to restore the Plains to a grazing region
47.	4.222	1 a grazing region	1 PROP	1 what they (the Plains) had been in days of cattle kingdom and earlier
48.	1.2	1 the New Deal farm program	1 PROP	1 much criticism of the New Deal farm program
49.	5.3	1 much criticism of the New Deal farm program	0 EXAMP	1 many farmers did not like being told how much they could plant
50.	5.3	1 much criticism of the New Deal farm program	0 EXAMP	1 deliberately creating scarcity when people were hungry seemed immoral
51.	5.3	1 much criticism of the New Deal farm program	0 EXAMP	1 benefits of the AAA were unequal
52.	5.5	1 much criticism of the New Deal farm program	1 NOT SIM	1 Rel Prop. #54
53.	1.2	1 the New Deal farm program	1 PROP	1 Rel. Prop. #54
54.		1 provided more direct assistance to farmers	1 GREATER	1 direct assistance to any other group in the population

#223: DUST BOWL

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	0	1
55.	1.282	provided more direct assistance to farmers	PROP	saved hundreds of thousands of families
		1	1	1
56.	1.2822	saved hundreds of thousands of families	PROP	from bleak despair and poverty

#224 First Phase of the Roosevelt Administration

(no heading)

During the first phase of the Roosevelt administration, 1933 to early 1935, the dominant purposes were recovery and relief. During this period, the President and his advisers had the idea that through a series of temporary expedients they could get the economy into high gear again, and then let it carry on by its own momentum. This "first New Deal" was therefore not much different in purpose and philosophy from Hoover's efforts to stem the depression. During this early period, too, Roosevelt resembled Hoover in seeking the support of the business community. He spoke of an alliance of "business and banking, argiculture and industry, and labor and capital." His purpose throughout his entire presidency was to save the capitalist system. The difference from the previous administration was in the magnitude and variety of legislation and in a much greater willingness to call on the full powers of the federal government.

Although opponents charged that the New Deal was inspired by alien "isms," its origins were mostly to be found in earlier American protest movements, such as those of the Populists and the progressives. FDR put into effect several measures first proposed by Teddy Roosevelt. New Deal laws dealing with banking, the tariff, and child labor were further developments of legislation passed under Woodrow Wilson. The New Deal was, however, so much more far-reading than anything achieved or proposed by Theodore Roosevelt or Wilson that it had the aspects of a revolution.

#224--FIRST PHASE OF THE ROOSEVELT ADMINISTRATION

1933 to early 1935

called the first New Deal

had dominant purposes recovery relief

≈ Hoover's efforts to stem the Depression

in purpose and philosophy

President and his advisors had the idea

a series of temporary expedients ⇒ get economy into high gear → let it carry on by its own momentum

Roosevelt sought support of the business community

spoke of alliance

of business and banking

of agriculture and industry

of labor and capital

purpose was to save the capitalist system

throughout his entire presidency

≉ previous Administration

which was Hoover's

magnitude of legislation

variety of legislation

much greater willingness to call on the full powers of the federal government

its origins were mostly to be found in earlier American protest movements

≉ (although) opponents charged New Deal was inspired by alien "isms"

those of Populists

those of Progressives

FDR put into effect several measures first proposed by Theodore Roosevelt

some New Deal laws were further developments of legislation passed under Woodrow Wilson

banking laws

tariff laws

child labor laws

≉ anything achieved or proposed by Theodore Roosevelt or Wilson

New Deal so much more far-reaching ⇒ had aspects of a revolution

#224: FIRST PHASE OF ROOSEVELT'S ADMINISTRATION

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	1 First phase of Roosevelt administration	1 PROP	1 1933 to early 1935
2.	1.2	1 First phase of Roosevelt administration	1 PROP	1 called the First New Deal
3.	1.2	1 First phase of Roosevelt administration	1 PROP	1 had dominant purposes
4.	1.23	1 dominant purposes	1 EXAMP	1 recovery
5.	1.23	1 dominant purposes	1 EXAMP	1 relief
6.	1.4	1 First phase of Roosevelt administration	1 SIM	1 Hoover's efforts to stem the depression
7.	1.42	1 Rel. Prop. #6	1 PROP	1 in purpose and philosophy
8.	1.43	1 Rel. Prop. #6	0 EXAMP	1 President and his advisors had the idea
9.		1 President and his advisors had the idea	0 EXAMP	1 Rel. Prop. #10,11
10.	1.4337	1 a series of temporary expedients	1 CAUS	1 get economy into high gear
11.	1.43376	1 get economy into high gear	1 PREC	1 let it carry on by its own momentum
12.	1.43	1 Rel. Prop. #6	0 EXAMP	1 Roosevelt sought support of the business community
13.	1.433	1 Roosevelt sought support of the business community	0 EXAMP	1 spoke of alliance

#224: FIRST PHASE OF ROOSEVELT'S ADMINISTRATION

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
14.	1.4333	1 spoke of alliance	1 EXAMP	1 of business and banking
15.	1.4333	1 spoke of alliance	1 EXAMP	1 of agriculture and industry
16.	1.4333	1 spoke of allinace	1 EXAMP	1 of labor and capital
17.	1.43	1 Rel. Prop. #6	0 EXAMP	1 purpose was to save the capitalist system
18.	1.432	1 purpose was to save the capitalist system	1 PROP	1 throughout his entire presidency
19.	1.5	1 First phase of the Roosevelt administration	1 NOT SIM	1 previous administration
20.	1.52	1 previous administration	0 PROP	0 which was Hoover's
21.	1.53	1 Rel. Prop. #19	1 EXAMP	1 magnitude of legislation
22.	1.53	1 Rel. Prop. #19	1 EXAMP	1 variety of legislation
23.	1.53	1 Rel. Prop. #19	1 EXAMP	1 much greater willingness to call on the full powers of the federal government
24.	1.2	1 First phase of the Roosevelt administration	1 PROP	1 its origins were mostly to be found in earlier American protests movements
25.	1.2	1 First phase of the Roosevelt administration	1 PROP	1 opponents charged New Deal was inspired by alien "isms"
26.	1.25	1 its origins were mostly to be found in earlier American protest movements	1 NOT SIM	1 opponents charged New Deal was inspired by alien "isms"

#224: FIRST PHASE OF ROOSEVELT'S ADMINISTRATION

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
27.	2.3	its origins were mostly to be found in earlier American protest movements	EXAMP	those of Populists
		1	1	1
28.	2.3	its origins were mostly to be found in earlier American protest movements	EXAMP	those of Progressives
		1	0	1
29.	2.3	its origins were mostly to be found in earlier American protest movements	EXAMP	FDR put into effect several measures first proposed by Theodore Roosevelt
		1	0	1
30.	2.3	its origins were mostly to be found in earlier American protest movements	EXAMP	some New Deal laws were further developments of legislation passed under Woodrow Wilson
		1	1	1
31.	2.33	some New Deal laws were further developments of legislation passed under Woodrow Wilson	EXAMP	banking laws
		1	1	1
32.	2.33	some New Deal laws were further developments of legislation passed under Woodrow Wilson	EXAMP	tariff laws
		1	1	1
33.	2.33	some New Deal laws were further devleopments of legislation passed under Woodrow Wilson	EXAMP	child labor laws
		1	1	1
34.	2.35	FDR put into effect several measures first proposed by Theodore Roosevelt	NOT SIM	anything achieved or proposed by Theodore Roosevelt or Woodrow Wilson

#224: FIRST PHASE OF ROOSEVELT'S ADMINISTRATION

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
35.	2.35	Some New Deal laws were further developments of legislation passed under Woodrow Wilson	NOT SIM	anything achieved or proposed by Theodore Roosevelt or Woodrow Wilson
		1	0	1
36.	2.352	anything achieved or proposed by Theodore Roosevelt or Woodrow Wilson	PROP	Rel. Prop. #37
		1	0	1
37.	2.3527	New Deal was so much more far reaching	CAUS	had aspects of a revolution

#225 First Phase of the New Deal

First Phase of the New Deal: "Try Something"

Roosevelt came into office with no very clear idea of how he was going to deal with the economic crisis. This did not dismay him. "There is nothing to do," he said, "but meet each day's troubles as they come." Some laws were passed against the President's wishes, but he signed them to head off something he liked even less, or to avoid holding up other legislation. His principal contribution to the New Deal, in addition to dynamic leadership and political skill, was his "try something" philosophy. He likened himself to a quarterback on a football team who calls plays, and if one does not work, tries another. In any case, he felt, action was better than inaction.

The New Deal was thus no carefully worked out program, like that of Alexander Hamilton in the Washington administration, or that proposed by Woodrow Wilsom when he took office in 1913. Instead, it reflected the haste which went with trying to attack the depression on many fronts at once. It reflected the special demands of pressure groups. Some New Deal measures would have been enacted sooner or later in any case, because they embodied longstanding demands for change. Thus Congress repealed the Volstead Act and permitted the sale of light wines and beer. In December 1933 came the Twenty-first Amendment, which repealed the Prohibition amendment once and for all.

#225--FIRST PHASE OF THE NEW DEAL

Roosevelt had no very clear idea of how to deal with economic crisis

- when he came into office
- did not dismay him
  - "There is nothing to do but meet each day's troubles as they come"
- he wished some laws had not been passed
  - (but) ⋇ he signed them anyway
    - ⟹ to head off something he liked even less
    - ⟹ to avoid holding up legislation
- his principal contribution to the New Deal
  - dynamic leadership
  - political skill
  - his philosophy
    - "try something"
    - DEF: he felt action better than inaction (in any case)
      - saw himself as quarterback on a football team
      - calls plays
        - if one doesn't work → try another
- ⟹ New Deal was not a carefully worked out program
  - tried to attack the Depression on many fronts at once
    - reflected haste
  - reflected the special demands of pressure groups
  - some measures embodied long standing demands for change ⟹ would have been enacted sooner or later
  - Congress repealed Volstead Act → Twenty-first Amendment came
    - permitted sale of light wine and beer
    - in December 1933
    - repealed the prohibition amendment
      - once and for all
- ⋇ carefully worked out programs
  - (instead) ⋇
  - that of Alexander Hamilton's
    - in the Washington Administration
  - that proposed by Woodrow Wilson
    - when he took office in 1913

#225: "TRY SOMETHING"

#	embeddedness	CONCEPT A	RELATIONSHIP	CONCEPT B
		1	0	1
1.	1.2	First phase of the New Deal	PROP	Roosevelt had no very clear idea of how to deal with economic crises
		1	1	1
2.	1.22	Roosevelt had no very clear idea of how to deal with economic crises	PROP	when he came into office
		1	1	1
3.	1.22	Roosevelt had no very clear idea of how to deal with economic crises	PROP	did not dismay him
		1	0	1
4.	1.223	did not dismay him	EXAMP	"There is nothing to do but meet each day's troubles as they come"
		1	1	1
5.	1.22	Roosevelt had no very clear idea of how to deal with economic crises	PROP	he wished some laws had not been passed
		1	1	1
6.	1.225	he wished some laws had not been passed	NOT SIM	he signed them anyway
		1	0	1
7.	1.2257	he signed them anyway	CAUS	to head off something he liked even less
		1	0	1
8.	1.2257	he signed them anyway	CAUS	to avoid holding up legislation
		1	0	1
9.	1.22	Roosevelt had no very clear idea of how to deal with economic crises	PROP	his principal contribution to the New Deal
		1	1	1
10.	1.223	his principal contribution to the New Deal	EXAMP	dynamic leadership
		1	1	1
11.	1.223	his principal contribution to the New Deal	EXAMP	political skill

#225: "TRY SOMETHING"

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
12.	1.223	his prinicpal contribution to the New Deal	EXAMP	his philosophy
		1	1	1
13.	1.2232	his philosophy	PROP	"try something"
		1	0	1
14.	1.2231	his philosophy	DEF	he felt action was better than inaction (in any case)
		1	0	1
15.	1.22313	he felt action was better than inaction	EXAMP	saw himself as a quarterback on a football team
		1	1	1
16.	1.223132	quarterback on a football team	PROP	calls plays
		1	1	1
17.	1.2231322	calls plays	PROP	if one doesn't work, then try another
		1	1	1
18.	1.22313226	if one doesn't work	PREC	try another
		1	0	1
19.	1.7	Roosevelt had no very clear idea of how to deal with economic crises	CAUS	New Deal was not carefully worked out program
		1	1	1
20.	2.2	New Deal not carefully worked out program	PROP	tried to attack the Depression on many fronts at once
		1	1	1
21.	2.22	tried to attack Depression on many fronts at once	PROP	reflected haste
		1	1	1
22.	2.5	New Deal was not carefully worked out program	NOT SIM	carefully worked out program
		1	1	1
23.	2.53	carefully worked out programs	EXAMP	that of Alexander Hamilton

#225: "TRY SOMETHING"

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
24.	2.532	1 that of Alexander Hamilton's	1 PROP	1 in the Washington Administration
25.	2.53	1 carefully worked out programs	1 EXAMP	1 that proposed by Woodrow Wilson
26.	2.532	1 that proposed by Woodrow Wilson	1 PROP	1 when he took office in 1913
27.	2.25	1 Rel. Prop. #21	1 NOT SIM	1 Rel. Prop. #24, 26
28.	2.2	1 New Deal was not carefully worked out program	1 PROP	1 reflected the special demands of pressure groups
29.	2.2	1 New Deal was not carefully worked out program	0 PROP	1 Rel. Prop. #30
30.	2.27	1 some measures embodied long standing demands for change	1 CAUS	1 would have been enacted sooner or later
31.	2.273	1 Rel. Prop. #30	0 EXAMP	1 Congress repealed Volstead Act
32.	2.2732	1 Congress repealed Volstead Act	0 PROP	1 permitted sale of light wine and beer
33.	2.2736	1 Congress repealed Volstead Act	0 PREC	1 Twenty-First Amendment
34.	2.27362	1 Twenty-First Amendment came	1 PROP	1 in December 1933
35.	2.27362	1 Twenty-First Amendement came	1 PROP	1 repealed the prohibition amendment
36.	2.273622	1 repealed the prohibition amendment	1 PROP	1 once and for all

#226 The American Economy Was Close to Rock Bottom

Rock Bottom

By summer of 1932 the American economy was close to rock bottom. National income had dropped from $81,000,000,000 to $41,000,000,000. The steal industry was working at 22 per cent of capacity. Thousands of business concerns had gone into bankruptcy and thousands of banks had closed their doors. A quarter of a third of the industrial laborers of the country were unemployed and many others worked only part time. In every large city there were bread lines, soup kitchens, people selling apples on street corners, and people so hungry they raided garbage cans. A popular song, "Brother, Can You Spare a Dime?" reflected the frequency of begging. Local governments, faced by dwindling tax receipts and mounting relief costs, were so near bankruptcy that fire fighters, police, and schoolteachers sometimes went unpaid for months at a time.

The depression was uneven in its impact. It tended to have the harshest effects on those who could least bear it. Thus the wages paid industrial workers, and the income received by farmers fell more rapidly than dividends and interests from stocks and bonds. Those with fixed incomes, such as college professors, were actually better off because prices declined. Although the bottom dropped out of the new car market, enough people managed to hold on to their old ones so that the use of gasoline did not decrease. Cigarette sales rose steadly.

#226--THE AMERICAN ECONOMY WAS CLOSE TO ROCK BOTTOM

by the summer of 1932

national income had dropped from $81,000,000,000 to $41,000,000,000

steel industry was working at 22% capacity

thousands of business concerns had gone into bankruptcy

thousands of banks had closed their doors

employment of industrial laborers of country

- 1/4 to 1/3 were unemployed
- many others worked only part-time

conditions in every large city

- bread lines
- soup kitchens
- people selling apples on street corners
- people so hungry ⇒ they raided garbage cans

begging was frequent

reflected by "Brother Can You Spare A Dime"

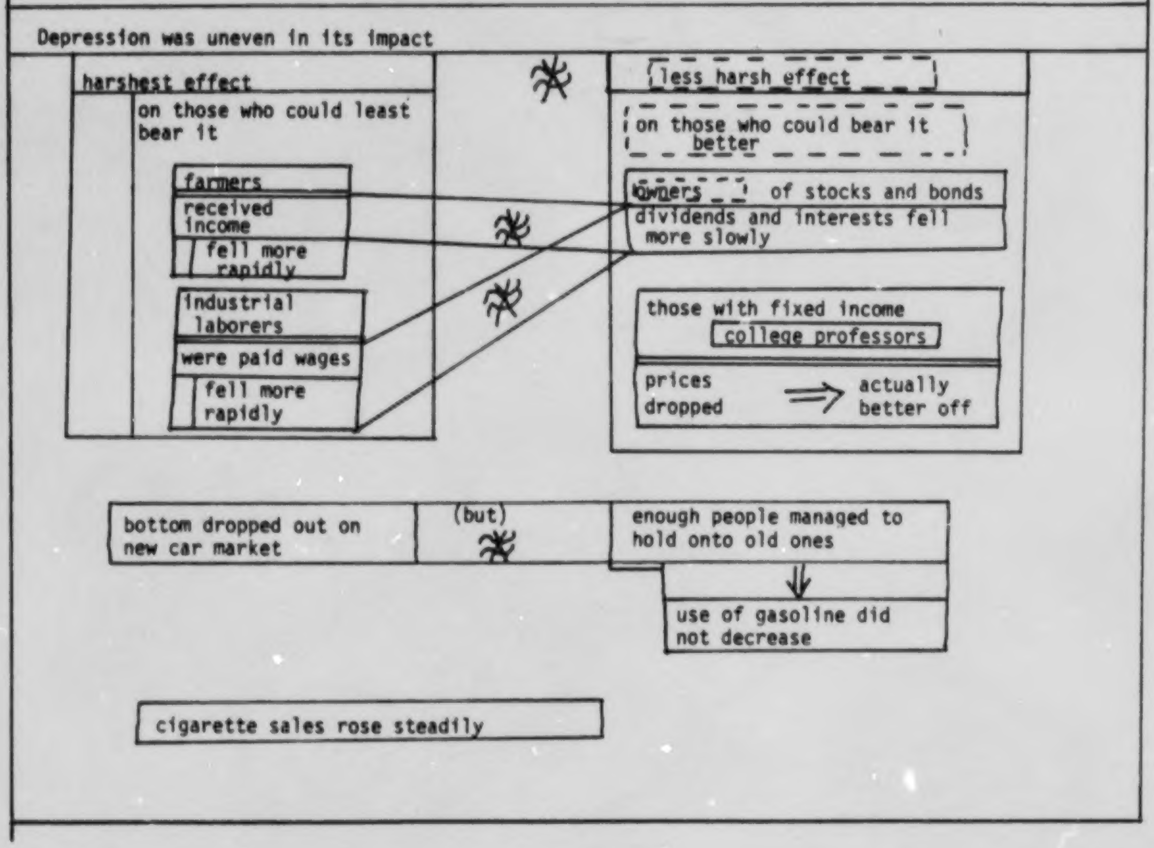
a popular song

dwindling tax receipts
mounting relief costs
⇒ local government so near bankruptcy ⇒ employees not paid for months at a time

- firefighters
- teachers
- police

(continued)

(continuation of #226)



Depression was uneven in its impact

harshest effect

on those who could least bear it

farmers

received income

fell more rapidly

industrial laborers

were paid wages

fell more rapidly

less harsh effect

on those who could bear it better

owners of stocks and bonds

dividends and interests fell more slowly

those with fixed income

college professors

prices dropped ⇒ actually better off

bottom dropped out on new car market

(but)

enough people managed to hold onto old ones

↓

use of gasoline did not decrease

cigarette sales rose steadily

#226: ROCK BOTTOM

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
1.	1.2	The American economy was close to rock bottom	PROP	by the summer of 1932
		1	0	1
2.	1.3	The American economy was close to rock bottom	EXAMP	national income had dropped from $81,000,000,000 to $41,000,000,000
		1	0	1
3.	1.3	The American economy was close to rock bottom	EXAMP	steel industry was working at 22% capacity
		1	0	1
4.	1.3	The American economy was close to rock bottom	EXAMP	thousands of business concerns had gone into bankruptcy
		1	0	1
5.	1.3	The American econmy was close to rock bottom	EXAMP	thousands of banks had closed their doors
		1	0	1
6.	1.3	The American economy was close to rock bottom	EXAMP	employment of industrial laborers of country
		1	0	1
7.	1.33	employment of industrial laborers of country	EXAMP	1/4 to 1/3 were unemployed
		1	0	1
8.	1.33	employment of industrial laborers of country	EXAMP	many others worked only part-time
		1	0	1
9.	1.3	The American economy was close to rock bottom	EXAMP	conditions in every large city
		1	0	1
10.	1.33	conditions in every large city	EXAMP	bread lines
		1	0	1
11.	1.33	conditions in every large city	EXAMP	soup kitchens

#226: ROCK BOTTOM

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
12.	1.33	1 conditions in every large city	0 EXAMP	1 people selling apples on street corners
13.	1.33	1 conditions in every large city	0 EXAMP	1 Rel. Prop. #14
14.	1.37	1 people so hungry	1 CAUS	1 they raided garbage cans
15.	1.3	1 The American economy was close to rock bottom	0 EXAMP	1 begging was frequent
16.	1.32	1 begging was frequent	1 PROP	1 reflected by "Brother Can You Spare a Dime"
17.		1 "Brother Can You Spare A Dime"	1 PROP	1 a popular song
18.	1.3	1 The American economy was close to rock bottom	0 EXAMP	1 Rel. Prop. #19, 20, 21
19.	1.37	1 dwindling tax receipts	0 CAUS	1 local government so near bankruptcy
20.	1.37	1 mounting relief costs	0 CAUS	1 local government so near bankruptcy
21.	1.377	1 local government so near bankruptcy	1 CAUS	1 employees not paid for months at a time
22.	1.3773	1 employees not paid for months at a time	0 EXAMP	1 firefighters
23.	1.3773	1 employees not paid for months at a time	0 EXAMP	1 police
24.		1 employees not paid for months at a time	0 EXAMP	1 teachers

#226: ROCK BOTTOM

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
		1	1	1
25.	1.2	The American economy was close to rock bottom	PROP	depression was uneven in its impact
		1	0	1
26.	2.3	depression was uneven in its impact	EXAMP	had harshest effect
		1	0	0
27.	2.3	depression was uneven in its impact	EXAMP	had less harsh effect
		1	0	0
28.	2.35	harshest effect	NOT SIM	less harsh effect
		1	1	1
29.	2.32	harshest effect	PROP	on those who could least bear it
		0	0	0
30.	2.32	less harsh effect	PROP	on those who could bear it better
		1	1	1
31.	2.323	those who could least bear it	EXAMP	farmers
		1	1	1
32.	2.3232	farmers	PROP	received income
		1	1	1
33.	2.32322	income	PROP	fell more rapidly
		1	1	1
34.	2.323	those who could least bear it	EXAMP	industrial laborers
		1	1	1
35.	2.3232	industrial laborers	PROP	were paid wages
		1	1	1
36.	2.32322	wages	PROP	fell more rapidly
		0	0	0
37.	2.323	those who could bear it better	EXAMP	owners of stocks and bonds

#226: ROCK BOTTOM

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
38.	2.3232	stocks and bonds	PROP	dividends and interests fell more slowly
		1	1	1
39.	2.323225	income fell more rapidly	NOT SIM	dividends and interests fell more slowly
		1	1	1
40.	2.323225	wages fell more rapidly	NOT SIM	dividends and interests fell more slowly
		0	0	1
41.	2.323	those who could bear it better	EXAMP	those with fixed incomes
		1	1	1
42.	2.3233	those with fixed incomes	EXAMP	college professors
		1	1	1
43.	2.3232	those with fixed incomes	PROP	Rel. Prop. #44
		1	1	1
44.	2.32327	prices dropped	CAUS	actually better off
		1	0	1
45.	2.3	depression was uneven in its impact	EXAMP	Rel. Prop. #46
		1	1	1
46.	2.35	bottom dropped out on new car market	NOT SIM	enough people managed to hold onto old ones
		1	1	1
47.	2.357	enough people managed to hold onto old ones	CAUS	use of gasoline did not decrease
		1	0	1
48.	2.3	depression was uneven in its impact	EXAMP	cigarette sales rose steadily

#227 Effects on Millions of Young Americans

Work for Youth

Perhaps the greatest tragedy of the depression was its effect upon millions of young Americans. Many were forced to leave school or college because they lacked food and clothing or were homeless. Those who graduated during the depression years faced unemployment. Thousands of jobless young Americans roamed the nation in search of work.

Two agencies were created to bring immediate work relief to the nation's youth. In 1933 the Civilian Conservation Corps (CCC) was organized. At times as many as 500,000 young men between 18 and 25 were enrolled in the CCC. Nearly all of them were unmarried; most came from poverty-stricken families. These youths lived in work camps scattered across the land. They received food, clothing, and shelter; they were paid wages which they were expected to share with their families; and they were offered opportunities for recreation and education.

The young Americans in the CCC did socially useful work. They build fire trails in the forest, cleared swamps, planted trees, built small dams for flood control, cleared land for public parks, and in other ways helped to conserve the nation's natural resources.

A second New Deal work relief measure aided young people still in school. The National Youth Administration (NYA), created in 1935, distributed federal money to needy students, who were paid regular wages for performing tasks in and around their school. During its first year the NYA gave jobs to more than 400,000 students.

The New Deal youth program saved hundreds of thousands of youths from idleness, helped them to maintain their self-respect, and enabled many to get an education. It also kept many young Americans out of the overcrowded job market in business and industry.

#227--EFFECTS ON MILLIONS OF YOUNG AMERICANS

perhaps the greatest tragedy of the Depression

- lack of food
- lack of clothing
- lack of shelter

⇒ many forced to leave school or college

- those who graduated during the depression ⟶ faced unemployment
- thousands of jobless young Americans roamed the nation in search of work

⟶ New Deal work relief measures

- 2 agencies created ⇒ brought immediate relief to nation's youth
  - Civilian Conservation Corps
    - known as CCC
    - organized in 1933
    - enrolled as many as 500,000 young men at times
      - between 18 and 25 years old
      - nearly all were unmarried
      - most were from poverty stricken families
      - lived in work camps
        - scattered across the country
      - received food
      - received clothing
      - received shelter
      - were paid wages
        - expected to share wages with family
      - were offered opportunities for recreation
      - were offered opportunities for education
      - helped conserve nation's natural resources
        - did socially useful work
          - built fire trails in forests
          - built small dams for flood control
          - other ways
          - cleared swamps
          - planted trees
          - cleared land for public parks
  - National Youth Administration
    - known as NYA
    - created in 1935
    - aided young people still in school
    - distributed federal money to needy students
      - performed tasks in and aroung their school ⟶ paid regular wages
    - gave jobs to more than 400,000 students during its first year
- saved hundreds of thousands of youths from idleness
- helped youths maintain self-respect
- enabled many to get an education
- kept young Americans out of the job market
- overcrowded
  - in business
  - in industry

#227: WORK FOR YOUTH

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
1.	1.2	1 effects on millions of young Americans	1 PROP	1 perhaps the greatest tragedy of the depression
2.	1.3	1 effects on millions of young Americans	0 EXAMP	1 lack of food
3.	1.3	1 effects on millions of young Americans	0 EXMAP	1 lack of clothing
4.	1.3	1 effects on millions of young Americans	0 EXAMP	1 homeless
5.	1.37	1 lack of food, lack of clothing, homeless	1 CAUS	1 many forced to leave school or college
6.	1.3	1 effects on millions of young Americans	0 EXAMP	1 many forced to leave school or college
7.	1.3	1 effects on millions of young Americans	0 EXAMP	1 Rel. Prop. #8
8.	1.36	1 those who graduated during Depression	0 PREC	1 faced unemployment
9.	1.3	1 effects on millions of young Americans	0 EXAMP	1 thousands of jobless young Americans roamed the nation in search of work
10.	1.6	1 effects on millions of young Americans	0 PREC	1 New Deal work relief measures
11.	2.2	1 New Deal work relief measures	1 PROP	1 two agencies created
12.	2.2	1 New Deal work relief measures	1 PROP	1 brought immediate relief to nation's youth

#227: WORK FOR YOUTH

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
13.	2.27	two agencies created	CAUS	brought immediate relief to nation's youth
		1	1	1
14.	2.3	New Deal work relief measures	EXAMP	Civilian Conservation Corps
		1	1	1
15.	2.32	Civilian Conservation Corps	PROP	known as CCC
		1	1	1
16.	2.32	CCC	PROP	organized in 1933
		1	1	1
17.	2.32	CCC	PROP	enrolled as many as 500,000 young men at times
		1	1	1
18.	2.322	young men	PROP	between 18 and 25 years old
		1	1	1
19.	2.322	young men	PROP	nearly all were unmarried
		1	1	1
20.	2.322	young men	PROP	most from poverty stricken families
		1	1	1
21.	2.322	young men	PROP	lived in work camps
		1	1	1
22.	2.3222	work camps	PROP	scattered across the country
		1	1	1
23.	2.322	young men	PROP	received food
		1	1	1
24.	2.322	young men	PROP	received clothing
		1	1	1
25.	2.322	young men	PROP	received shelter
		1	1	1
26.	2.322	young men	PROP	were paid wages
		1	1	1
27.	2.3222	were paid wages	PORP	were expected to share wages with their families

#227: WORK FOR YOUTH

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
28.	2.322	young men	PROP	were offered opportunities for recreation
		1	1	1
29.	2.322	young men	PROP	were offered opportunities for education
		1	1	1
30.	2.322	young men	PROP	helped to conserve nation's natural resources
		1	0	1
31.	2.3222	helped to conserve nation's natural resources	PROP	socially useful work
		1	0	1
32.	2.3223	helped to conserve nation's natural resources	EXAMP	built fire trails
		1	1	1
33.	2.32232	built fire trails	PROP	in forests
		1	0	1
34.	2.3223	helped to conserve nation's natural resources	EXAMP	cleared swamps
		1	0	1
35.	2.3223	helped to conserve nation's natural resources	EXAMP	planted trees
		1	0	1
36.	2.3223	helped to conserve nation's natural resources	EXAMP	built small dams
		1	1	1
37.	2.32232	built small dams	PROP	for flood control
		1	0	1
38.		helped to conserve nation's natural resources	EXAMP	cleared land
		1	1	1
39.	2.32232	cleared land	PROP	for public parks
		1	1	1
40.	2.3223	helped to conserve nation's natural resources	EXAMP	other ways

#227: WORK FOR YOUTH

#	embed- dedness	CONCEPT A	RELATION- SHIP	CONCEPT B
		1	1	1
41.	2.3	New Deal work relief measures	EXAMP	National Youth Administration
		1	1	1
42.	2.32	National Youth Administration	PROP	known as NYA
		1	1	1
43.	2.32	NYA	PROP	created in 1935
		1	1	1
44.	2.32	NYA	PROP	aided young people still in school
		1	1	1
45.	2.32	NYA	PROP	distributed federal money to needy students
		1	1	1
46.	2.322	needy students	PROP	performed tasks in and around their school
		1	1	1
47.	2.322	needy	PROP	were paid regular wages
		1	0	1
48.	2.3226	performed tasks in and around their school	PREC	were paid regular wages
		1	1	1
49.	2.32	NYA	PROP	gave jobs to more than 400,000 students during its first year
		0	1	1
50.	2.2	New Deal work relief measures	PROP	saved hundreds of thousands of youths from idleness
		0	1	1
51.	2.2	New Deal work relief measures	PROP	helped youths maintain self-respect
		0	1	1
52.	2.2	New Deal work relief measures	PROP	enabled many to get an education
		0	1	1
53.	2.2	New Deal work relief measures	PROP	kept young Americans out of the job market
		1	1	1
54.	2.22	job market	PROP	overcrowded

#227: WORK FOR YOUTH

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
55.	2.223	overcrowded	EXAMP	in business
		1	1	1
56.	2.223	overcrowded	EXAMP	in industry

#228 Franklin Delano Roosevelt

(no heading)

President Franklin Delano Roosevelt took office on March 4, 1933, in the midst of the Great Depression. He began his administration with a ringing call to the American people to face the future with courage and faith. "The only thing we have to fear is fear itself," he condifently stated. His calm words helped to lift the nation from its despair and helped to rally the people behind the government.

The President outlined his New Deal program in a crisp, dramatic Inaugural Address. He them presented his reform proposals, with recommendations for immediate action, to a special session of Congress that he called soon after taking office.

The New Deal had in general three aims--relief, recovery, and reform. Because Americans were clamoring for action, the three aims were often mixed together as objectives of a single act of Congress. Sometimes measures adopted to realize one of the aims interfered with other measures designed to achieve the other aims.

But for easier analysis, it is convenient to divide the New Deal into its three essential parts: (1) measures to provide relief for the unemployed; (2) measures to speed the recovery of agriculture, industry, commerce, and labor; and (3) measures to remedy certain weaknesses in the economic system.

Such was the general nature of the Great Experiment that President Roosevelt and Congress launched in the Spring of 1933.

#228--FRANKLIN DELANO ROOSEVELT

was a president

took office on March 4, 1933

began presidency in the midst of a Great Depression

→

began Administration with a ringing call to the American people

told them to face the future with courage and faith

had calm words

"The only thing we have to fear is fear itself"

confidently stated

lifted the nation from despair

rallied the people behind the government

had a New Deal Program

outlined in his Inaugural Address

crisp

dramatic

→

called a special session of Congress

soon after taking office

→

presented reform proposals to the Congress

presented reforms with recommendations for immediate action

had three general aims

relief

recovery

reform

Americans were clamoring for action

⇒

the aims were often mixed together as objectives of a single act of Congress

sometimes measures adopted to realize one of the aims interfered with other measures designed to achieve the other aims

but easier to analyze when divided into 3 parts

relief

measures to provide relief for the unemployed

recovery

measures to speed recovery

of agricul

of indust

of commerce

of labor

reform

measures to remedy weaknesses in the economic system

called the Great Experiment

began in the spring of 1933

launched by congress and FDR

#228: FRANKLIN DELANO ROOSEVELT

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
		1	1	1
1.	1.2	Franklin Delano Roosevelt	PROP	was a president
		1	1	1
2.	2.2	president	PROP	took office on March 4, 1933
		1	1	1
3.	2.2	president	PROP	began presidency in the midst of a Great Depression
		1	0	1
4.	2.26	took office on March 4, 1933	PREC	began administration with a ringing call to the American people
		1	1	1
5.	2.262	ringing call	PROP	told them to face the future with courage and faith
		1	0	1
6.	2.262	ringing call	PROP	had calm words
		1	0	1
7.	2.2623	calm words	EXAMP	"The only thing we have to fear is fear itself."
		1	1	1
8.	2.26232	"The only thing we have to fear is fear itself."	PROP	stated confidently
		1	1	1
9.	2.2622	calm words	PROP	lifted the nation from its despair
		1	1	1
10.	2.2622	calm words	PROP	rallied the people behind the government
		1	1	1
11.	2.2	FDR	PROP	had a New Deal Program
		1	1	1
12.	3.2	New Deal Program	PROP	outlined in his Inaugural Address
		1	1	1
13.	3.22	Inaugural Address	PROP	crisp
		1	1	1
14.	3.22	Inaugural Address	PROP	dramatic

#228: FRANKLIN DELANO ROOSEVELT

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
15.	3.26	Inaugural Address	PREC	called a specail session of Congress
		1	1	1
16.	3.262	called a special session of Congress	PROP	soon after taking office
		1	1	1
17.	3.266	called a special session of Congress	PREC	presented reform proposals to Congress
		1	1	1
18.	3.2662	presented reform proposals to Congress	PROP	presented reforms with recommendations for immediate action
		1	1	1
19.	3.2	New Deal Program	PROP	had three general aims
		1	1	1
20.	3.23	general aims	EXAMP	relief
		1	1	1
21.	3.23	general aims	EXAMP	recovery
		1	1	1
22.	3.23	general aims	EXAMP	reform
		1	1	1
23.	3.22	general aims	PROP	#24
		1	1	1
24.	3.227	Americans clamoring for action	CAUS	aims were often mixed together as objectives of a single act of Congress
		1	1	1
25.	3.2272	aims were often mixed together as objectives of a single act of Congress	PROP	sometimes measures adopted to realize one of the aims interfered with other measures designed to achieve the other aims
		0	0	1
26.	3.2	genral aims	PROP	But easier to analyze when divided into three parts
		1	1	0
27.	4.3	three parts	EXAMP	relief

#228: FRANKLIN DELANO ROOSEVELT

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		0	0	1
28.	4.32	relief	PROP	measures to provide relief for the unemployed
		1	1	0
29.	4.3	three parts	EXAMP	recovery
		0	0	1
30.	4.32	recovery	PROP	measures to speed recovery
		1	0	1
31.	4.323	measures to speed recovery	EXAMP	of agriculture
		1	0	1
32.	4.323	measures to speed recovery	EXAMP	of commerce
		1	0	1
33.	4.323	measures to speed recovery	EXAMP	of industry
		1	0	1
34.	4.323	measures to speed recovery	EXAMP	of labor
		1	1	0
35.	4.3	three parts	EXAMP	reform
		0	0	1
36.	4.3	reform	PROP	measures to remedy weaknesses in the economic system
		0	0	1
37.	3.2	New Deal Program	PROP	called the Great Experiment
		0	1	1
38.	3.2	New Deal Program	PROP	began in the Spring of 1933
		0	1	1
39.		New Deal Program	PROP	launched by Congress and FDR

#229 Roosevelt's Financial Policies

Roosevelt's financial policies opposed

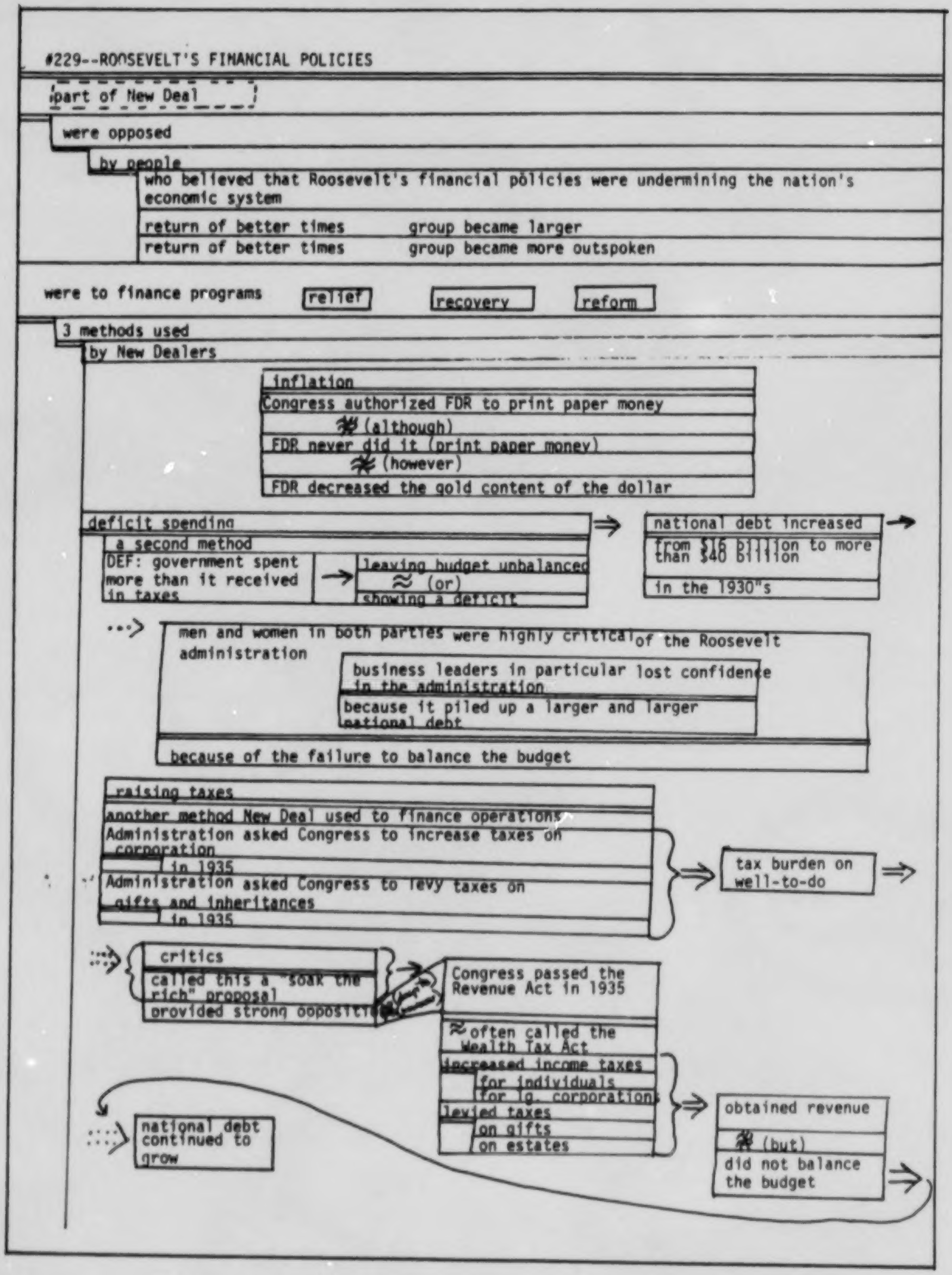
Much of the opposition to the New Deal came from people who believed that Roosevelt's financial policies were undermining the nation's economic system. With the return of better times this group became larger and more outspoken.

The New Dealers used three different methods for financing their relief, recovery, and reform programs.

One method was inflation. Although Congress authorized President Roosevelt to print paper money, he never did so. He did, however, decrease the gold content of the dollar.

A second method was deficit spending. This meant that the government spent more than it received in taxes, leaving the budget unbalanced, or showing a deficit. In the 1930's the national debt increased from about $16 billion to more than $40 billion. Men and women in both parties were highly critical of the failure of the Roosevelt administration to balance the budget. Business leaders in particular lost confidence in an administration that piled up a larger and larger national debt.

Another method by which the New Deal had financed its operations was by raising taxes. In 1935 the administration asked Congress to increase taxes on corporations and to levy taxes on gifts and inheritances. Critics called this a "soak the rich" proposal because it put a new tax burden upon the well-to-do. Despite strong opposition, however, Congress passed the Revenue Act of 1935, often called the Wealth Tax Act. With this measure Congress increased the income tax for individuals and large corporations and levied taxes on gifts and estates. But the revenue thus obtained did not balance the budget, and the national debt continued to grow.



#229--ROOSEVELT'S FINANCIAL POLICIES

part of New Deal

were opposed

by people

who believed that Roosevelt's financial policies were undermining the nation's economic system

return of better times group became larger

return of better times group became more outspoken

were to finance programs relief recovery reform

3 methods used

by New Dealers

inflation

Congress authorized FDR to print paper money

✻ (although)

FDR never did it (print paper money)

✻ (however)

FDR decreased the gold content of the dollar

deficit spending ⇒ national debt increased →

a second method

DEF: government spent more than it received in taxes → leaving budget unbalanced

≈ (or)

showing a deficit

from $16 billion to more than $40 billion

in the 1930"s

···> men and women in both parties were highly critical of the Roosevelt administration

business leaders in particular lost confidence in the administration

because it piled up a larger and larger national debt

because of the failure to balance the budget

raising taxes

another method New Deal used to finance operations

Administration asked Congress to increase taxes on corporation

in 1935

Administration asked Congress to levy taxes on gifts and inheritances

in 1935

⇒ tax burden on well-to-do ⇒

···> critics

called this a "soak the rich" proposal

provided strong opposition

→ Congress passed the Revenue Act in 1935

≈ often called the Wealth Tax Act

increased income taxes

for individuals

for lg. corporations

levied taxes

on gifts

on estates

⇒ obtained revenue

✻ (but)

did not balance the budget ⇒

···> national debt continued to grow

#229:

#	embeddedness	CONCEPT A	RELATIONSHIP	CONCEPT B
1.	1.2	1 Roosevelt's financial policies	0 PROP	0 part of New Deal
2.	1.22	1 New Deal (financial policies)	1 PROP	1 were opposed
3.	1.222	1 were opposed	1 PROP	1 by people
4.	1.2222	1 by people	1 PROP	1 who believed that Roosevelt's financial policies were undermining the nation's economic system
5.	1.2222	1 by people	1 PROP	1 Rel. Prop. #6
6.	1.22226	1 return of better times	0 PREC	1 group became larger
7.	1.2222	1 by people	1 PROP	1 Rel. Prop. #8
8.	1.22226	1 return of better times	0 PREC	1 group became more outspoken
9.	1.2	1 Roosevelt's financial policies	0 PROP	1 were to finance programs
10.	2.3	1 were to finance programs	0 EXAMP	1 relief
11.	2.3	1 were to finance programs	0 EXAMP	1 recovery
12.	2.3	1 were to finance programs	0 EXAMP	1 reform
13.	2.2	1 were to finance programs	1 PROP	1 3 methods used
14.	2.22	1 3 methods used	1 PROP	1 by New Dealers

#229:

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
15.	2.23	3 methods used	EXAMP	inflation
		1	0	1
16.	3.2	inflation	PROP	Congress authorized FDR to print paper money
		1	1	1
17.	3.25	Congress authorized FDR to print paper money	NOT SIM	FDR never did it (print paper money)
		1	0	1
18.	3.2	inflation	PROP	FDR never did it (print paper money)
		1	0	1
19.	3.2	inflation	PROP	FDR decreased gold content of the dollar
		1	1	1
20.	3.25	FDR never did it (print paper money)	NOT SIM	FDR decreased the gold content of the dollar
		1	1	1
21.	2.23	3 methods used	EXAMP	deficit spending
		1	1	1
22.	4.2	deficit spending	PROP	a second method
		1	1	1
23.	4.1	deficit spending	DEF	government spent more than it received in taxes
		1	1	1
24.	4.2	deficit spending	PROP	leaving budget unbalanced
		1	1	1
25.	4.2	deficit spending	PROP	showing a deficit
		1	0	1
26.	4.1	government spent more than it received in taxes	PROP	leaving budget unbalanced
		1	1	1
27.	4.164	leaving budget unbalanced	SIM	showing a deficit
		1	0	1
28.	4.7	deficit spending	CAUS	national debt increased

#229:

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
29.	4.72	1 national debt increase	1 PROP	1 from $16 billion to more than $40 billion
30.	4.72	1 national debt increase	1 PROP	1 in the 1930's
31.	4.76	1 national debt increase	0 TEMP	1 men and women in both parties were highly critical of the Roosevelt administration
32.	4.763	1 men and women in both parties were highly critical of the Roosevelt administration	1 EXAMP	1 business leaders in particular lost confidence in the administration
33.	4.763	1 business leaders in particular lost confidence in the administration	1 PROP	1 because it piled up a larger and larger national debt
34.	4.762	1 men and women in both parties were highly critical of the Roosevelt administration	1 PROP	1 because of the failure to balance the budget
35.	2.23	1 3 methods used	1 EXAMP	1 raising taxes
36.	5.2	1 raising taxes	1 PROP	1 another method New Deal used to finance operations
37.	5.2	1 raising taxes	0 PROP	1 Administration asked Congress to increase taxes on corporations
38.	5.22	1 Administration asked Congress to increase taxes on corporations	1 PROP	1 in 1935
40.	5.22	1 Administration asked Congress to levy taxes on gifts and inheritances	0 PROP	1 in 1935

#229:

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
		1	0	1
41.	5.227	Rel. Prop. #37, 38, 39, 40	CAUS	tax burden on the well-to-do
		1	1	1
42.	5.2277	tax burden on the well-to-do	CAUS	Rel. Prop. #43
		1	1	1
43.	5.22772	Critics	PROP	called tax burden a "soak the rich proposal"
		1	0	1
44.	5.22772	Critics	PROP	provided strong opposition
		1	0	1
45.	5.22776	Critics called this a "soak the rich" proposal	PREC	Congress passed the Revenue Act of 1935
		1	1	1
46.	5.227725	provided strong opposition	NOT SIM	Congress passed the Revenue Act of 1935
		1	1	1
47.	5.227762	Congress passed the Revenue Act of 1935	PROP	often called the Wealth Tax Act
		1	1	1
48.	5.227764	Congress passed the Revenue Act of 1935	SIM	The Wealth Tax Act
		1	1	1
49.	5.227762	Congress passed the Revenue Act of 1935	PROP	increased income taxes
		1	1	1
50.	5.2277622	increased income taxes	PROP	for individuals
		1	1	1
51.	5.2277622	increased income taxes	PROP	for large corporations
		1	1	1
52.	5.227762	Congress passed the Revenue Act of 1935	PROP	levied taxes
		1	1	1
53.	5.2277622	levied taxes	PROP	on gifts
		1	1	1
54.	5.2277622	levied taxes	PROP	on estates

#229:

#	embed-dedness	CONCEPT A	RELATIONSHIP	CONCEPT B
		1	0	1
55.	taxes (increased income taxes and levied taxes) 5.2277627		CAUS	obtained revenue
		1	1	1
56.	obtained revenue 5.22776275		NOT SIM	did not balance the budget
		1	0	1
57.	did not balance the budget 5.227762757		CAUS	national debt continued to grow

#230 The Natioanl Industry Recovery Act

The NIRA

The Natioanl Industrial Recovery Act went into effect in June 1933 as a two-year emergency measure. It was intended to revive industry by enabling American employers to cooperate in a great planned effort to find employment for jobless workers and to raise wages. Cooperation was to replace competition as one of the major driving forces of American industry. Antitrust legislation, such as the Sherman and Clayton antitrust acts, was disregarded. Instead the government officially encouraged businesses to end competition and form cooperative trade associations.

The NIRA provided that each industry should, with the aid of the National Recovery Administration (NRA), adopt a "code of fair practices." Once these codes had been approved by the President, they became binding upon the entire industry.

Under the vigorous leadership of General Hugh S. Johnson, administrative head of the NRA, some 95 percent of American industries adopted fair practice codes within a few months. The codes differed a great deal. But in general they limited production and provided for the common control of prices and sales practices. Most codes also outlawed child labor and required that adults not work more than 40 hours a week and that wages not be less than $12 to $15 a week.

#230--THE NATIONAL INDUSTRIAL RECOVERY ACT (NIRA)

- went into effect in June 1933
- was an emergency measure
  - a two-year measure
- intended to revive industry
  - cooperation was to replace competition
    - as one of major driving forces of American industry

- enable American employers to cooperate in a great planned effort
  - to find employment for jobless workers
  - to raise wages

- antitrust legislation
  - Sherman Antitrust Act
  - Clayton Antitrust Act
- was disregarded
- (instead)
  - government officially encouraged business to end competition
  - government officially encouraged business to form cooperative trade associations

- provided that each industry should adopt a "code of fair practices" → approved by president → codes became binding on whole industry → (within a few months) 95% of American industries adopted fair practices codes
  - under General Hugh S. Johnson
    - vigorous leadership
    - administrative head
- with the aid of the National Recovery Administration (NRA)
  - codes differed a great deal
  - (but)
  - in general (most codes) were similar
    - limited production
    - common control of prices and sales practices
    - outlawed child labor
    - required adults not to work more than 40 hrs. per wk.
    - wages not to be less than $12-15 per wk

#230: NIRA

#	embed-dedness		CONCEPT A		RELATION-SHIP		CONCEPT B
1.	1.2	1	NIRA	1	PROP	1	went into effect in June 1933
2.	1.2	1	NIRA	1	PROP	1	was an emergency measure
3.	1.22	1	was an emergency measure	1	PROP	1	a 2-year measure
4.	1.2	1	NIRA	1	PROP	1	intended to revive industry
5.	2.2	1	intended to revive industry	0	PROP	1	cooperation was to replace competition
6.	2.22	1	cooperation was to replace competition	1	PROP	1	one of major driving forces of American Industry
7.	2.3	1	intended to revive industry	0	EXAMP	1	enable American employers to cooperate in a great planned effort
8.	2.33	1	enable American employers to cooperate in a great planned effort	0	EXAMP	1	to find employment for jobless workers
9.	2.33	1	enable American employers to cooperate in a great planned effort	0	EXAMP	1	to raise wages
10.	2.3	1	intended to revive industry	0	EXAMP	1	Rel. Prop. #11, 12
11.	2.35	1	Antitrust legislation	1	NOT SIM	1	government officially encouraged business to end competition
12.	2.35	1	Antitrust legislation	1	NOT SIM	1	government officially encouraged business to form cooperative trade associations
13.	2.33	1	Antitrust legislation	1	EXAMP	1	Sherman Antitrust Act

#230: NIRA

#	embeddedness		CONCEPT A		RELATIONSHIP		CONCEPT B
14.	2.33	1	Antitrust legislation	1	EXAMP	1	Clayton Antitrust Act
15.	2.32	1	Antitrust legislation	1	PROP	1	was disregarded
16.	1.2	1	NIRA	1	PROP	1	provided that each industry should adopt a "code of fair practices"
17.	3.2	1	provided that each industry should adopt a "code of fair practices"	1	PROP	1	with the aid of the National Recovery Administration (NRA)
18.	3.2	1	provided each industry should adopt a code of fair practices	1	PROP	1	codes differed a great deal
19.	3.2	1	provided each industry should adopt a code of fair practices	1	PROP	0	in general (most codes) were similar
20.	3.25	1	codes differed a great deal	1	NOT SIM	0	in general (most codes) were similar
21.	3.23	0	most codes were similar	0	EXAMP	1	limited production
22.	3.23	0	most codes were similar	0	EXAMP	1	common control of prices and sales practices
23.	3.23	0	most codes were similar	0	EXAMP	1	outlawed child labor
24.	3.23	0	most codes were similar	0	EXAMP	1	required adults not to work more than 40 hours per week
25.	3.23	0	most codes were similar	0	EXAMP	1	wages not to be less than $12 to $15 a week
26.	3.26	1	provided that each industry should adopt a "code of fair practices"	0	PREC	1	approved by President

#230: NIRA

#	embed-dedness	CONCEPT A	RELATION-SHIP	CONCEPT B
		1	1	1
27.	3.266	approved by President	PREC	codes became binding on whole industry
		1	1	1
28.	3.2666	codes became binding on whole industry	PREC	95% of American industries adopted fair practices codes
		1	1	1
29.	3.266622	95% of American industry adopted fair practices codes	PROP	under General Hugh S. Johnson
		1	1	1
30.	3.266622	General Hugh S. Johnson	PROP	vigorous leadership
		1	1	1
31.	3.266622	General Hugh S. Johnson	PROP	administrative head of NRA

APPENDIX E:

EXAMPLES OF THE SCORING AND RATIONALE FOR SCORING OF TWO FREE RECALL PROTOCOLS

Annotated Recall

Subject # = 075

[1]There are three main groups of one-celled organisms. [2]Sporozoans are dealt with in this section. [3]These are types of protozoa, and [4]although many xxx people believe they are related to humans, [5]they are not.

Relationship	Score	Phrase it comes from	Rationale
1.0	A	1 & 3 "protozoa"	When you first score Phrase 1, 1.1 gets a B since "protozoa" is not directly mentioned. But by convention 3, when you score Phrase 3 you go back and change 1.1 to A. Then by convention, the whole thing 1.0 gets an A.
1.1	A	1 & 3 "protozoa"	
1.2	A	1	
1.3	A	1	
37.3	B	1="one-celled organism"	This was the best we could do to give person credit for knowing that protozoa are one-celled organism. Person gets a B not A for 37.3 because "one-celled organism: is an inference from "enclosed in a single cell."
6.0	B	2	Just Concept II is explicit. One could argue that the relationship of example is pretty explicit but I wouldn't agree.
6.1	B	2	
6.2	B	2	
6.3	A	2	
3.0	B	2	Because person says sporozoans are dealt with in this section, that implies Relationship 3 & 5, but we can't of course give credit for any parts of these.
5.0	B	2	

Relationship	Score	Phrase it comes from	Rationale
Phrase 3 gets represented in Relationship 1 and in fact causes change of 1.1B to 1.1A and of 1.0 B to 1.0 A			
57.0	B	4	Relates specifically to "they are related to humans"
57.1	B	4	"Specialized creature" is rendered as "sporozoans" or "they"
57.2	A	4	Property relation is explicit in "are"
57.3	B	4	"Direct ancestor"... is rendered as are related to humans
58.0	B	4 & 5	Because again "direct ancestor"... is merely implied in "they are related to humans."
58.1	B	4 & 5	
58.2	A	5	
58.3	A	5	We are taking the author's use of unlikely to be stylistic and "they are not" to be a paraphrase.
59.0	B	4	Relates to "many people believe they are related to humans"
59.1	B	4	Same reason as 58.1
59.2	A	4	Relation is explicit.
59.3	A	4	"Many people believe" and "they are not" are seen as close paraphrase.
60.0	A	4 & 5	The two phrases are in contrast to each other explicitly with word "although"
60.1	A	4 & 5	
60.2	A	4 & 5	
60.3	A	4 & 5	

Annotated Recall

Subject # = 082

[1]Protozoans are one celled creatures.
xxx [2]Nervous and digestive systems may
be present. [3]They were not derived
from humans [4]although this belief is
popular. [5]Their name is misleading (first animal)
[6]as they are very complex organisms thus
requiring evolution. [7]They have no cell
walls and [8]cells division is very similar
to animal cell division.

Relationship	Score	Phrase it comes from	Rationale
1.1	A	1="Protozoans"	By convention 3 note that this is all of Relationship 1 that gets scored
37.3	B	1="one-celled creatures"	Same as for Subject 075
33.3	A	2	Person doesn't say anything about these systems being "properties of specialized structures."
34.3	A	2	
57.0	C	3 & 4	What makes this whole phrase incorrect (C) is the implication that anyone would think that protozoans are derived from humans. The text implies the other way around.. 57.1 gets B for same reason as Subject 075
57.1	B		
57.2	A		
57.3	C		
58.0	C	3 & 4	Same as Relationship 57
58.1	C	3 & 4	Same as Relationship 57.3
58.2	A	3 & 4	
58.3	A	3 & 4	Same as for 58.3 for Subject 075

Relationship	Score	Phrase it comes from	Rationale
59.0	C	3 & 4	Same as for Relationship 57
59.1	C	3 & 4	Same as for Relationship 57
59.2	A	3 & 4	Close paraphrase
59.3	A	3 & 4	Close paraphrase
60.0	A	3 & 4	Same, generally, as for subject 075
60.1	A	3 & 4	
60.2	A	3 & 4	
60.3	A	3 & 4	
24.0	A	5	"Their name" is stylistic substitution for "protozoa" Everything else is explicit.
24.1	A		
24.2	A		
24.3	A		
25.0	A	5	Obvious
25.1	A		
25.2	A		
25.3	A		
26.0	B	5	If protozoa "require evolution" to be explained then they must have evolved but this is only implied and the fact that this is a property of protozoa is also implied.
26.1	A		
26.2	B		
26.3	B		
27.0	A	6	Obvious
27.1	A		
27.2	A		
27.3	A		
28.0	A	6="thus requiring evolution"	"Thus" makes causal relationship explicit. The two concepts are explicitly mentioned.
28.1	A		
28.2	A		
28.3	A		

Relationship	Score	Phrase it comes from	Rationale
18.0	A	7	Obvious
18.1	A		
18.2	A		
18.3	A		
19.0	A	8	Obvious
19.1	A		
19.2	A		
19.3	A		

Appendix F

Tables of mean proportion scores of concepts and relationship parts recalled from the learning study

Table 2

BIOLOGY: Mean proportion scores for relationship parts of propositions identified by level and explicitness

1. A-scores (units judged to be explicitly recalled)

	Explicitness**		
Level*	Implicit	Explicit	Total
High	.115	.233	.199
Low	.110	.179	.161
Total	.113	.205	

*F (1, 863) = 7.79, p = .005

**F (1, 863) = 35.52, p = .001

Level X Explicitness: F (1, 863) = 2.25, p = .134

2. B-scores (units judged to be implicitly or partially recalled)

	Explicitness**		
Level*	Implicit	Explicit	Total
High	.115	.040	.061
Low	.084	.034	.047
Total	.101	.037	

*F (1, 863) = 2.37, p = .124

**F (1, 863) = 49.60, p = .001

Level X Explicitness F (1, 863) = 1.94, p = .165

Table 3

HISTORY: Mean proportion scores for concepts in relationship propositions identified by level and explicitness

1. A-scores (units judged to be explicitly recalled)

	Explicitness**		
Level*	Implicit	Explicit	Total
High	.139	.195	.190
Low	.142	.163	.163
Total	.139	.182	

*F (1, 1154) = 7.74, p = .005

**F (1, 1154) = 4.90, p = .027

Level X Explicitness: F (1, 1154) = .13, p = .715

2. B-scores (units judged to be implicitly or partially recalled)

	Explicitness**		
Level*	Implicit	Explicit	Total
High	.065	.059	.060
Low	.155	.048	.049
Total	.071	.054	

*F (1, 1154) = 3.29, p = .070

**F (1, 1154) = 1.11, p = .293

Level X Explicitness: F (1. 1154) = 4.50, p = .034

Table 4

HISTORY: Mean proportion scores for relationship parts in propositions identified by level and explicitness

1. A-scores (units judged to be explicitly recalled)

	Explicitness**		
Level*	Implicit	Explicit	Total
High	.096	.206	.160
Low	.125	.149	.143
Total	.105	.180	

*F (1, 575) = 3.92, p = .048

**F (1, 575) = 28.48, p = .001

Level X Explicitness: F (1, 575) = 7.32, p = .007

2. B-scores (units judged to be implicitly or partially recalled)

	Explicitness**		
Level*	Implicit	Explicit	Total
High	.113	.057	.080
Low	.104	.048	.063
Total	.110	.053	

*F (1, 575) = .79, p = .374

**F (1, 575) = 31.04, p = .001

Level X Explicitness: F (1, 575) = .00, p = .99

Table 5

BIOLOGY: Mean proportion scores for concepts in relationship propositions identified by embeddedness and relationship type

1. A-scores (explicit recall)

	LEVEL*		
Type**	High	Low	Total
Def	.488	.142	.281
Prop	.215	.179	.199
Examp	.179	.132	.159
Comp	.142	.068	.094
Temp	.128	.213	.196
Caus	.147	.135	.140
Total	.201	.158	

*F (1, 1722) = 15.61, p = .001

**F (5, 1722) = 9.31, p = .001

Type X Level: F (5, 1722) = 5.48, p = .001

2. B-score (implicit/partial recall)

	LEVEL*		
Type**	High	Low	Total
Def	.038	.038	.038
Prop	.054	.038	.047
Examp	.054	.046	.050
Comp	.031	.025	.027
Temp	.082	.057	.062
Caus	.095	.078	.085
Total	.055	.043	

*F (1, 1722) = 9.62, p = .002

**F (5, 1722) = 6.46, p = .001

Type X Level: F (5, 1722) = .268, p = .931

Table 6

BIOLOGY: Mean proportion scores for relationship parts in propositions identified by embeddedness and relationship type

1. A-scores (explicit recall)

	LEVEL*		
Type**	High	Low	Total
Def	.373	.132	.236
Prop	.244	.213	.230
Examp	.110	.049	.084
Comp	.147	.060	.091
Temp	.086	.229	.200
Caus	.086	.139	.117
Total	.199	.161	

*F (1, 855) = 5.49, p = .019
**F (5, 855) = 16.41, p = .001
Type X Level: F (5, 855) = 3.03, p = .010

2. B-score (implicit/partial recall)

	LEVEL*		
Type**	High	Low	Total
Def	.145	.057	.095
Prop	.028	.017	.023
Examp	.134	.124	.130
Comp	.026	.035	.032
Temp	.132	.057	.072
Caus	.128	.075	.097
Total	.061	.047	

*F (1, 855) = 4.45, p = .035
**F (5, 855) = 25.79, p = .001
Type X Level: F (5, 855) = 1.44, p = .209

Table 7

HISTORY: Mean proportion scores for concepts in relationship propositions identified by embeddedness and relationship type

1. A-scores (explicit recall)

	LEVEL*		
Type**	High	Low	Total
Def	.265	.215	.233
Prop	.207	.148	.184
Examp	.169	.136	.159
Comp	.094	.095	.094
Temp	.230	.223	.226
Caus	.266	.243	.252
Total	.190	.163	

*F (1, 1146) = 14.0, p = .001
**F (5, 1146) = 10.94, p = .001
Type X Level: F (5, 1146) = .66, p = .653

2. B-score (implicit/partial recall)

LEVEL*		
High	Low	Total
.028	.054	.044
.054	.044	.050
.079	.061	.073
.022	.031	.025
.034	.024	.029
.094	.072	.081
.060	.049	

*F (1, 1146) = 3.94, p = .047
**F (5, 1146) = 7.80, p = .001
Type X Level: F (5, 1146) = .44, p = .822

Table 8

HISTORY: Mean proportion scores for relationship parts in propositions identified by embeddedness and relationship type

1. A-scores (explicit recall)

	LEVEL*		
Type**	High	Low	Total
Def	.163	.031	.080
Prop	.231	.166	.205
Examp	.067	.061	.065
Comp	.087	.073	.083
Temp	.167	.171	.169
Caus	.176	.213	.198
Total	.160	.143	

*F (1, 567) = 5.66, p = .018

**F (5, 567) = 18.33, p = .001

Type X Level: F (5, 567) = 1.37, p = .232

2. B-score (implicit/partial recall)

	LEVEL*		
Type**	High	Low	Total
Def	.117	.176	.154
Prop	.028	.023	.026
Examp	.164	.131	.154
Comp	.022	.032	.025
Temp	.075	.068	.072
Caus	.158	.099	.123
Total	.080	.063	

*F (1, 567) = 2.61, p = .107

**F (5, 567) = 35.62, p = .001

Type X Level: F (5, 567) = 1.08, p = .371

Table 9

BIOLOGY: Mean proportion scores for concepts in relationship propositions identified by explicitness and relationship type

1. A-scores (explicit recall)

	EXPLICITNESS*		
Type**	Imp	Exp	Total
Def	.200	.285	.281
Prop	.190	.199	.199
Examp	.119	.164	.159
Comp	.080	.095	.094
Temp	.141	.199	.196
Caus	.025	.144	.140
Total	.148	.182	

*F (1, 1722) = 1.96, p = .161

**F (5, 1722) = 9.46, p = .001

Type X Exp: F (5, 1722) = .31, p = .905

2. B-score (implicit/partial recall)

	EXPLICITNESS*		
Type**	Imp	Exp	Total
Def	.095	.035	.038
Prop	.076	.045	.047
Examp	.075	.047	.050
Comp	.023	.027	.027
Temp	.046	.064	.062
Caus	.058	.086	.085
Total	.068	.047	

*F (1, 1722) = 6.60, p = .010

**F (5, 1722) = 6.27, p = .001

Type X Exp: F (5, 1722) = .89, p = .491

Table 10

BIOLOGY: Mean proportion scores for relationship parts in propositions identified by explicitness and relationship type

1. A-scores (explicit recall)

	EXPLICITNESS*		
Type**	Imp	Exp	Total
Def	.040	.297	.236
Prop	.182	.237	.230
Examp	.056	.126	.084
Comp	.067	.099	.091
Temp	.206	.190	.200
Caus	.063	.131	.117
Total	.113	.205	

*F (1, 855) = 9.66, p = .002

**F (5, 855) = 11.93, p = .001

Type X Exp: F (5, 855) = 1.06, p = .381

2. B-scores (implicit/partial recall)

EXPLICITNESS*		
Imp	Exp	Total
.172	.071	.095
.050	.019	.023
.153	.094	.130
.043	.029	.032
.077	.062	.072
.035	.113	.097
.101	.037	

*F (1, 855) = 10.18, p = .001

**F (5, 855) = 16.89, p = .001

Type X Exp: F (5, 855) = 2.57, p = .026

Table 11

HISTORY: Mean proportion scores for concepts in relationship propositions identified by explicitness and relationship type

1. A-scores (explicit recall)

	EXPLICITNESS*		
Type**	Imp	Exp	Total
Def	0	.233	.233
Prof	.147	.186	.184
Examp	.116	.162	.159
Comp	.042	.096	.094
Temp	0	.226	.226
Caus	.235	.253	.252
Total	.139	.182	

*F (1, 1148) = 2.90, p = .089

**F (5, 1148) = 9.20, p = .001

Type X Exp: F (5, 1148) = .04, p = .991

2. B-scores (implicit/partial recall)

EXPLICITNESS*		
Imp	Exp	Total
0	.044	.044
.029	.051	.050
.134	.069	.073
0	.026	.025
0	.029	.029
.154	.077	.081
.071	.054	

*F (1, 1148) = 1.23, p = .268

**F (5, 1148) = 7.78, p = .001

Type X Exp: F (5, 1148) = 4.69,
p = .003

Table 12

HISTORY: Mean proportion scores for relationship parts in propositions identified by explicitness and relationship type

1. A-scores (explicit recall) 2. B-scores (implicit/partial recall)

	1. A-scores (explicit recall)			2. B-scores (implicit/partial recall)		
	EXPLICITNESS*			EXPLICITNESS*		
Type**	Imp	Exp	Total	Imp	Exp	Total
Def	.038	.094	.080	.056	.186	.154
Prop	.143	.217	.205	.039	.024	.026
Examp	.071	.054	.065	.151	.160	.154
Comp	.068	.086	.083	.009	.029	.025
Temp	.122	.234	.169	.096	.038	.072
Caus	.190	.206	.198	.126	.120	.123
Total	.105	.180		.110	.053	

*F (1, 567) = 5.12, p = .024

**F (5, 556) = 12.88, p = .001

Type X Exp: F (5, 567) = 1.58, p = .164

*F (1, 567) = .28, p = .599

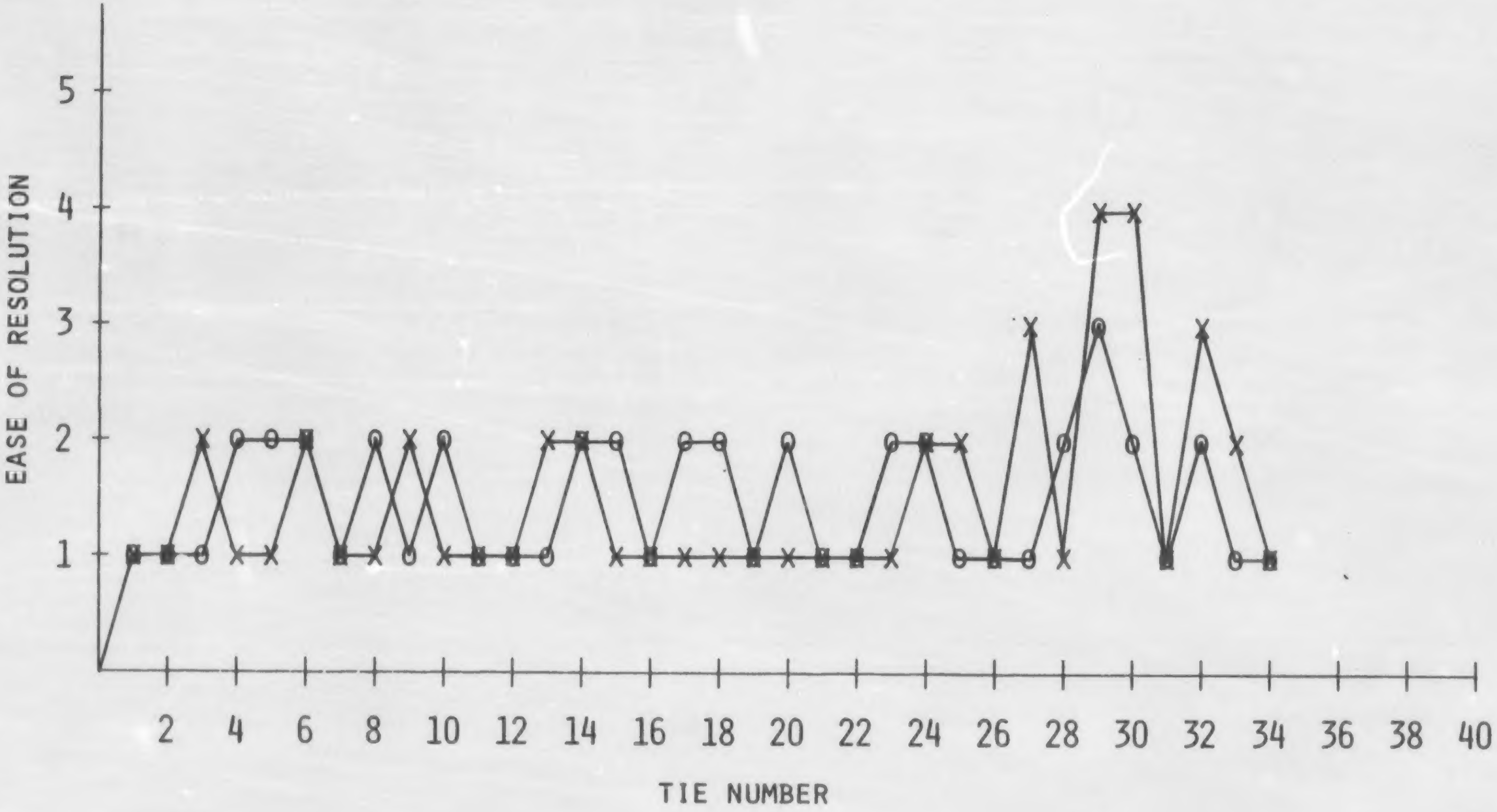
**F (5, 567) = 27.60, p = .001

Type X Exp: F (5, 567) = 1.30, p = .266

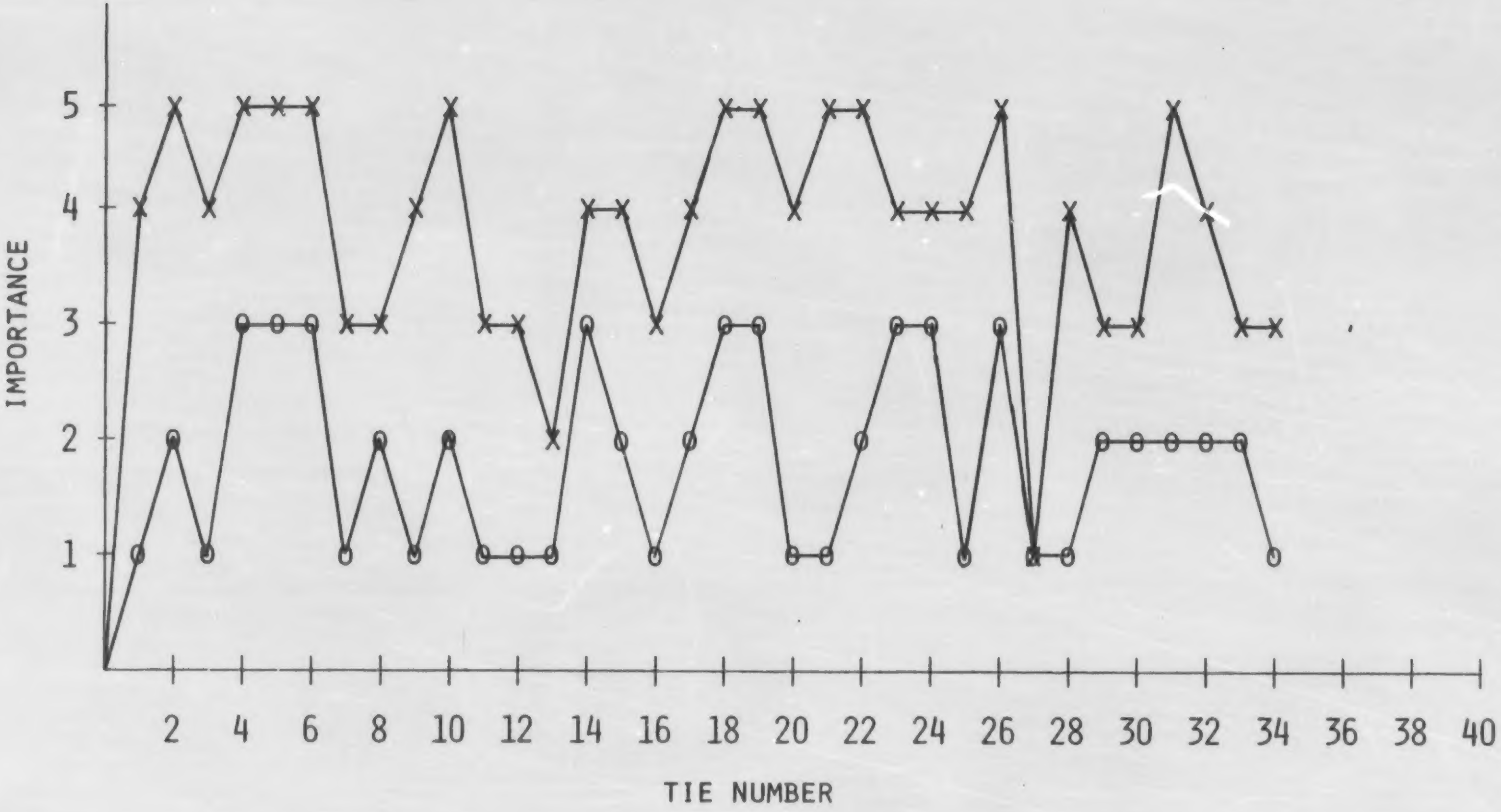
Appendix G

Individual Subjects' Ratings of the Ease of Resolution and the Importance of Cohesive Ties

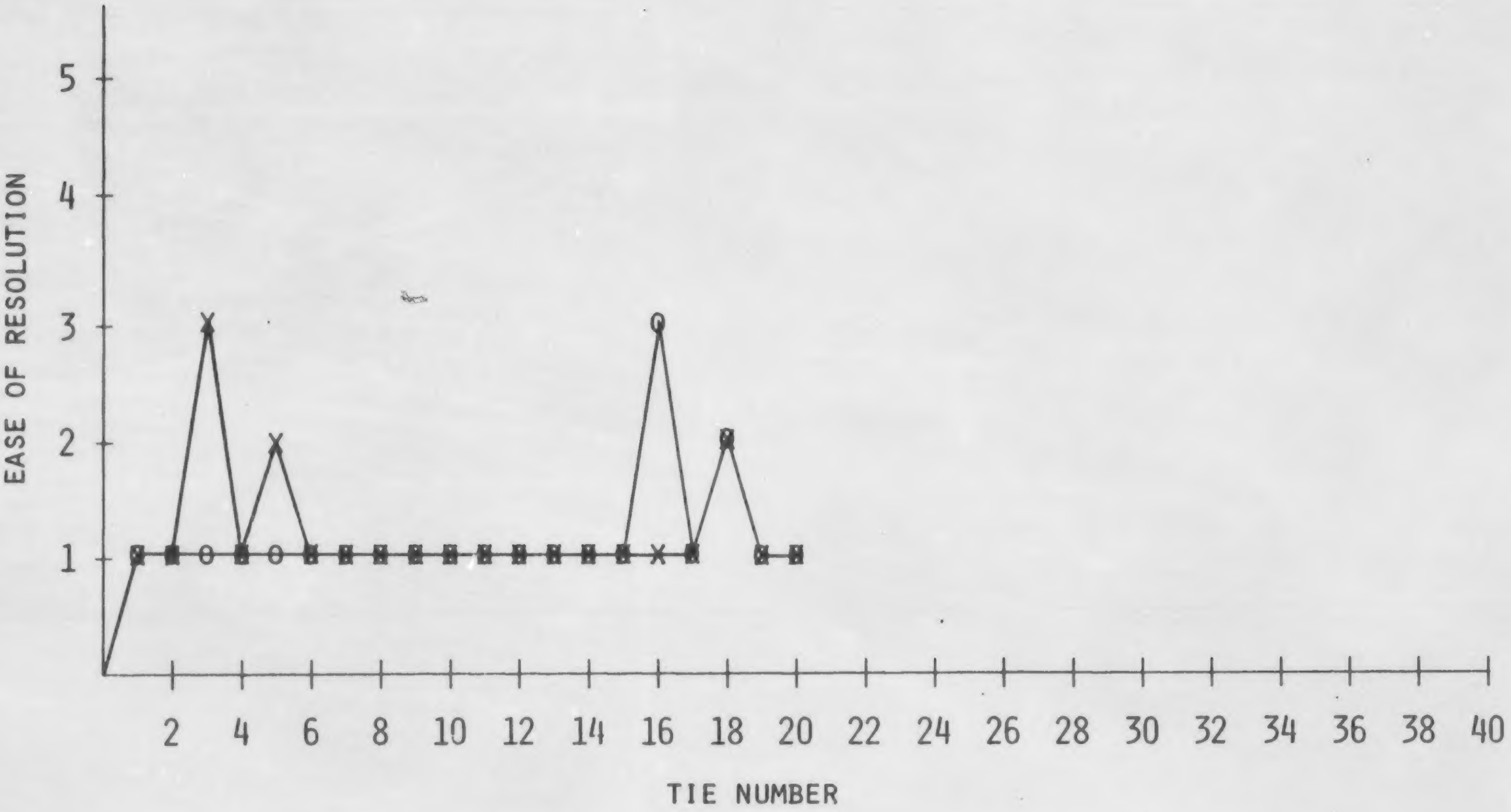
(refer to Section III, Part 4)



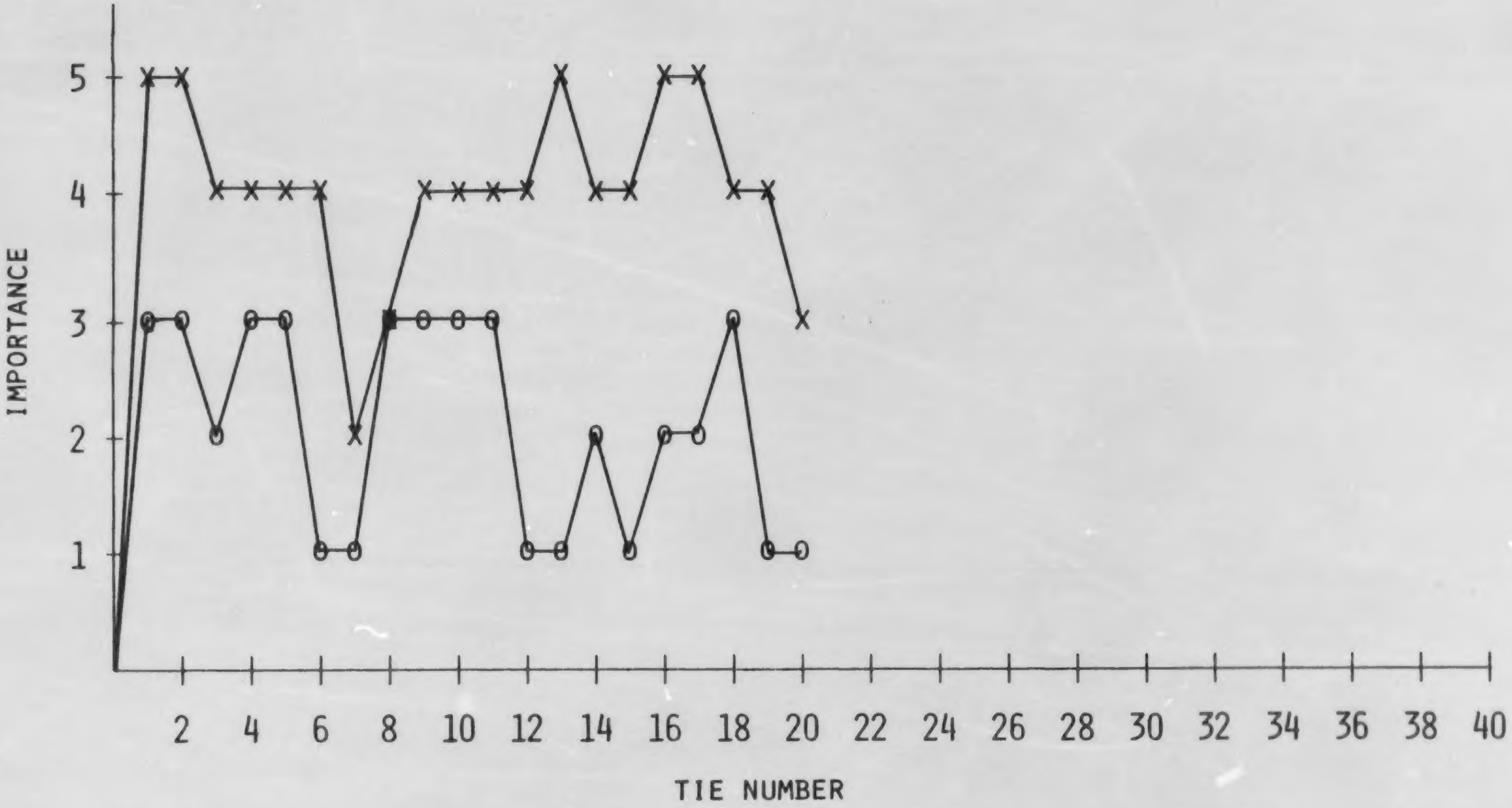
THE STRUCTURES OF A SNAKE'S HEAD



THE STRUCTURES OF A SNAKE'S HEAD

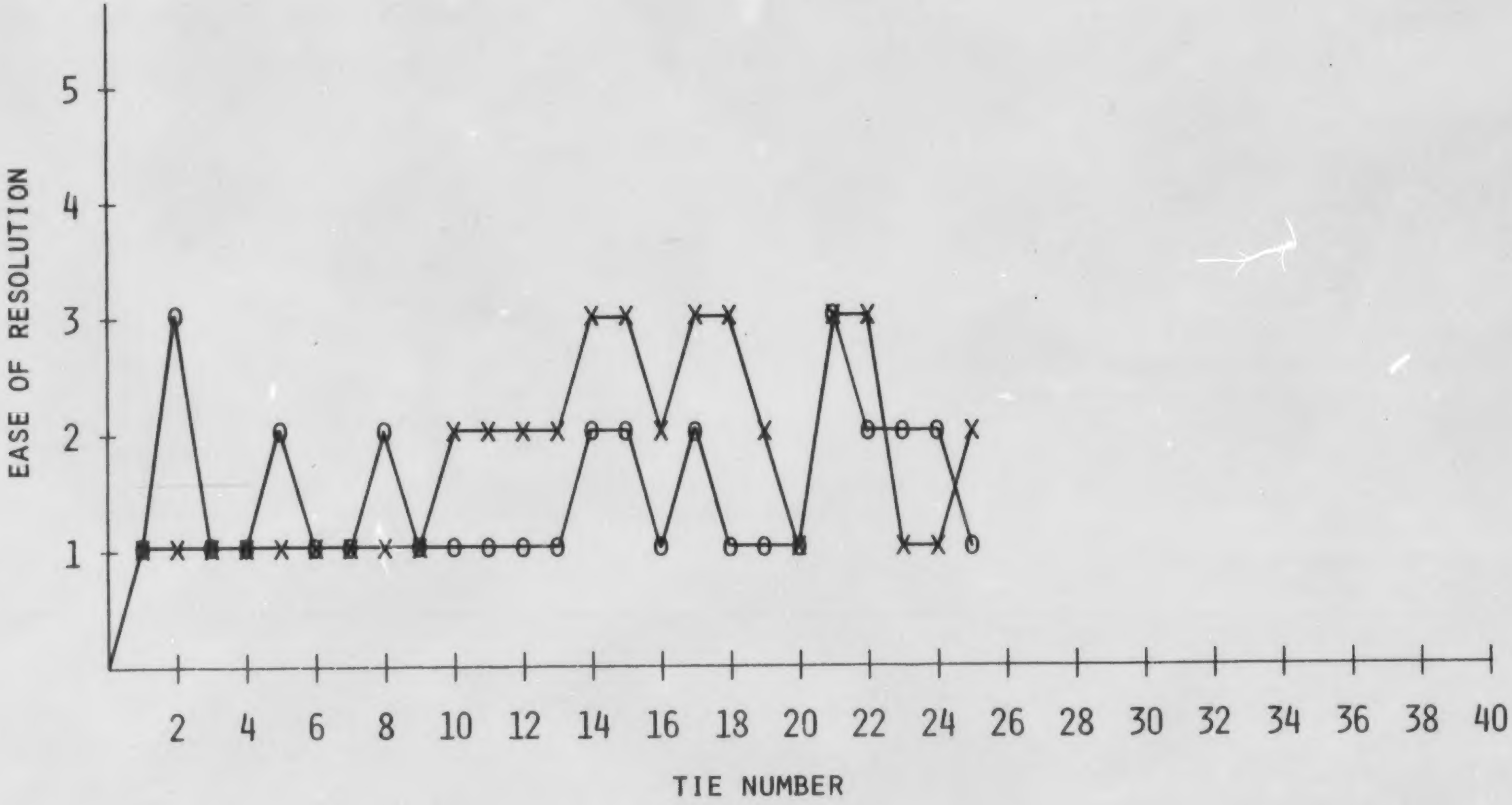


FRANKLIN DELANO ROOSEVELT

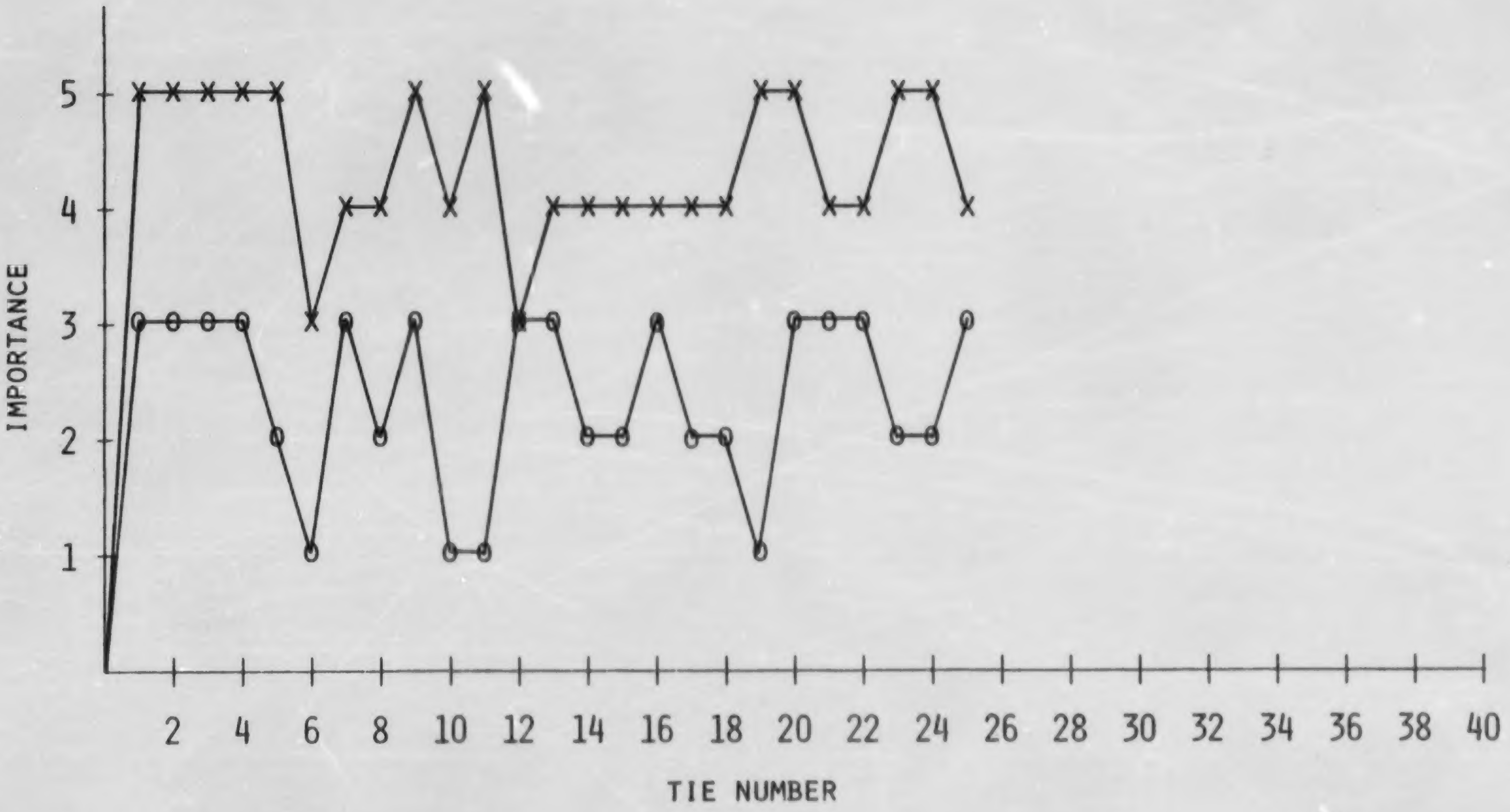


FRANKLIN DELANO ROOSEVELT

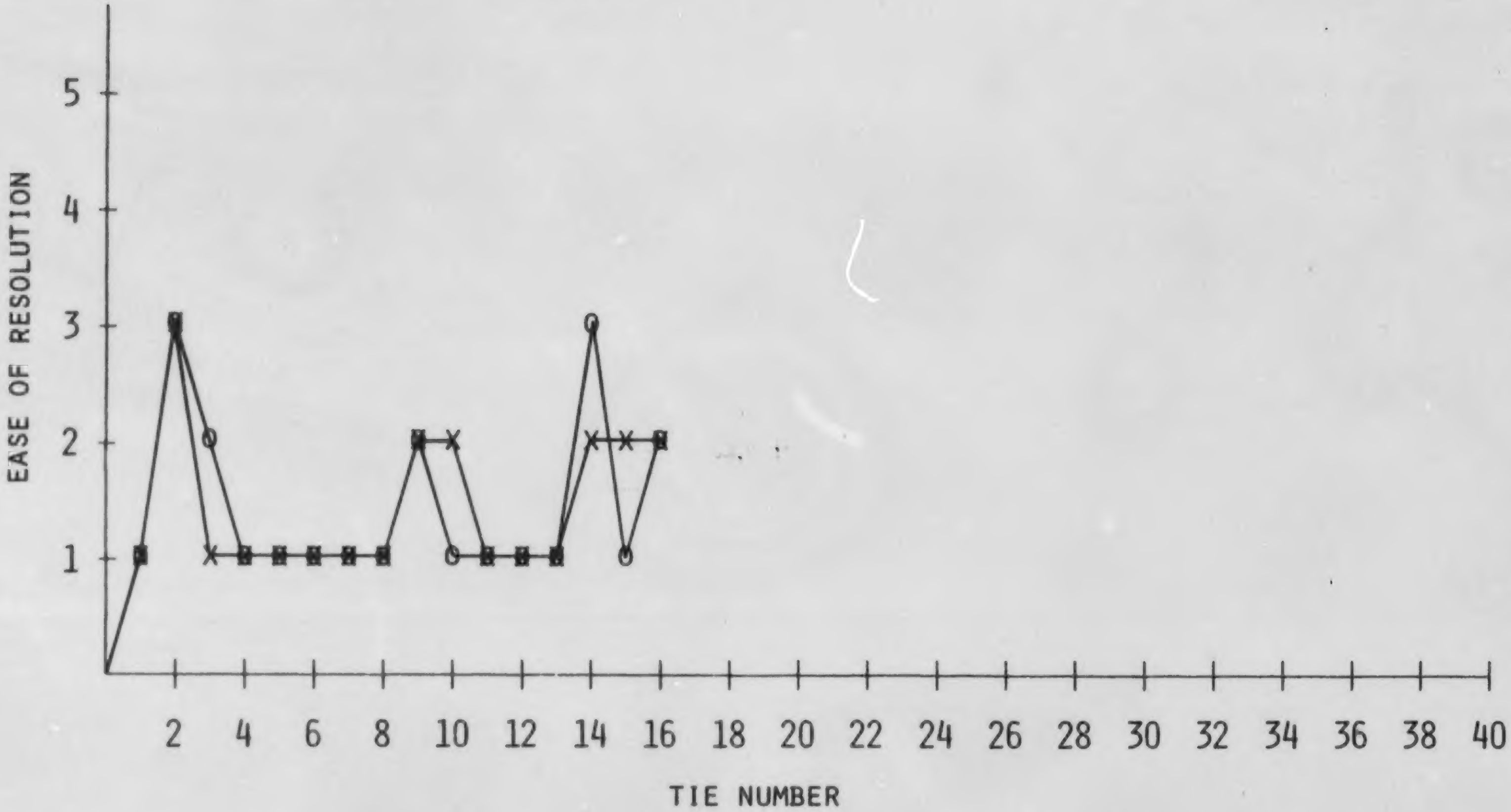
633



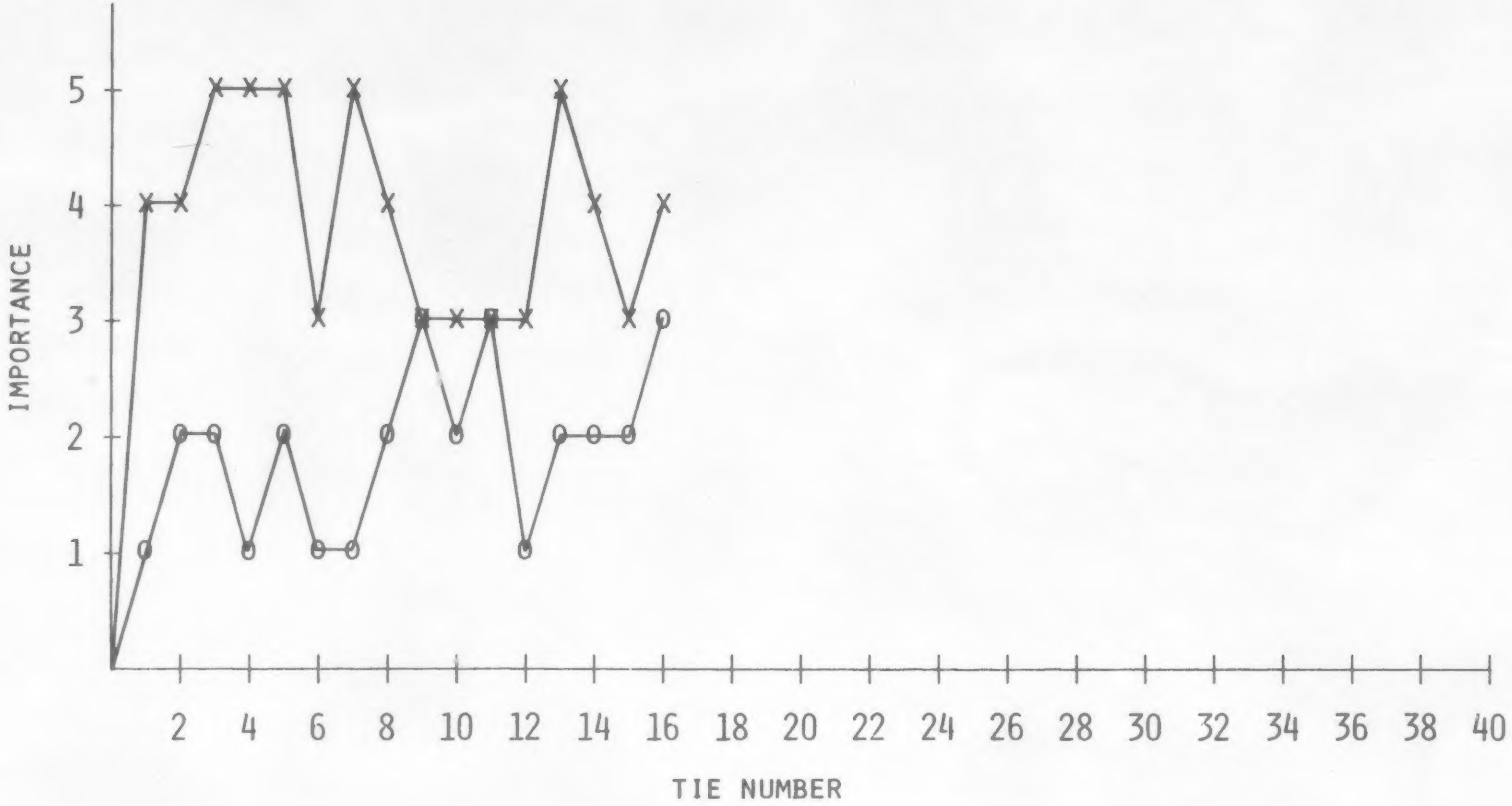
FIRST PHASE OF THE NEW DEAL: "TRY SOMETHING"



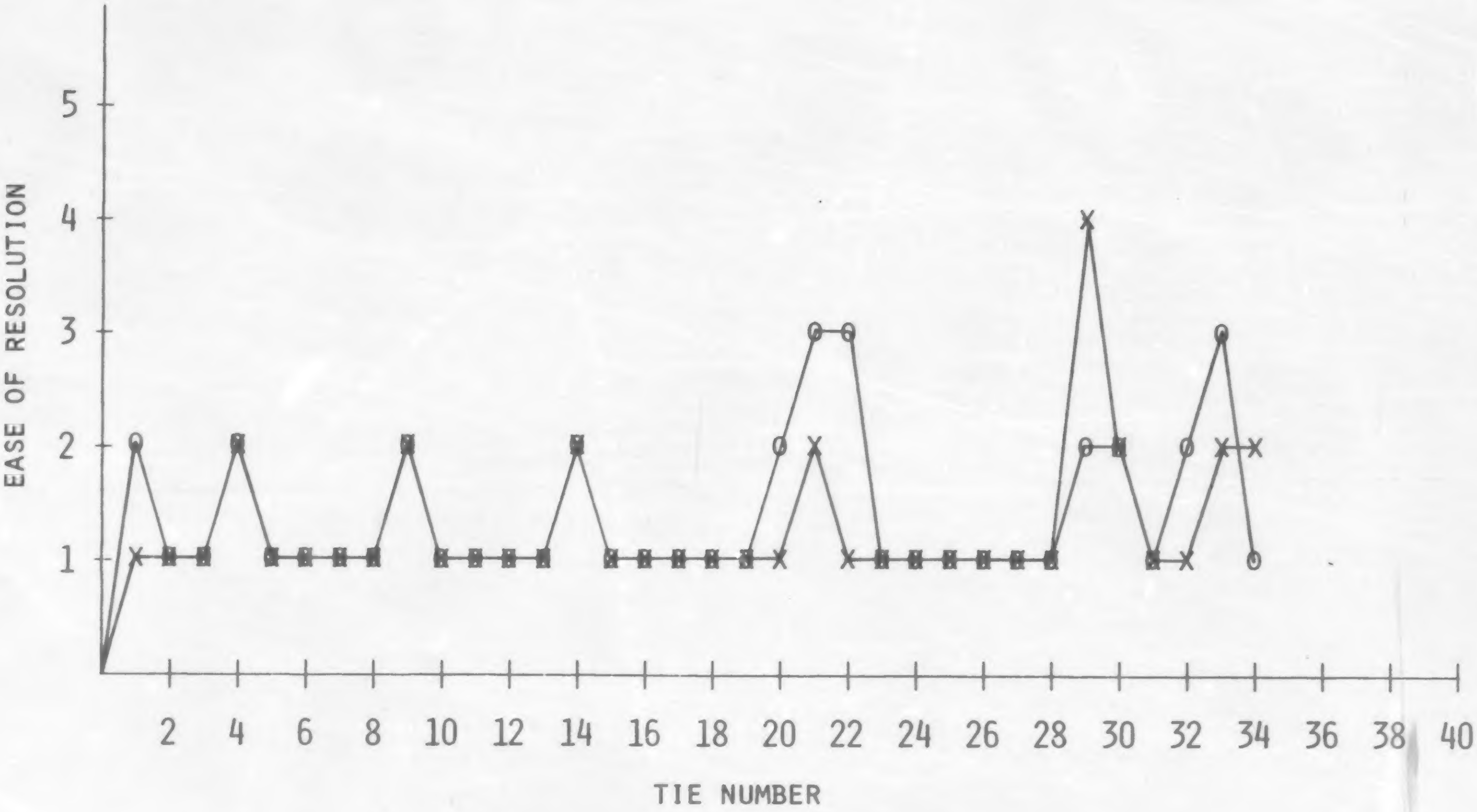
FIRST PHASE OF THE NEW DEAL: "TRY SOMETHING"



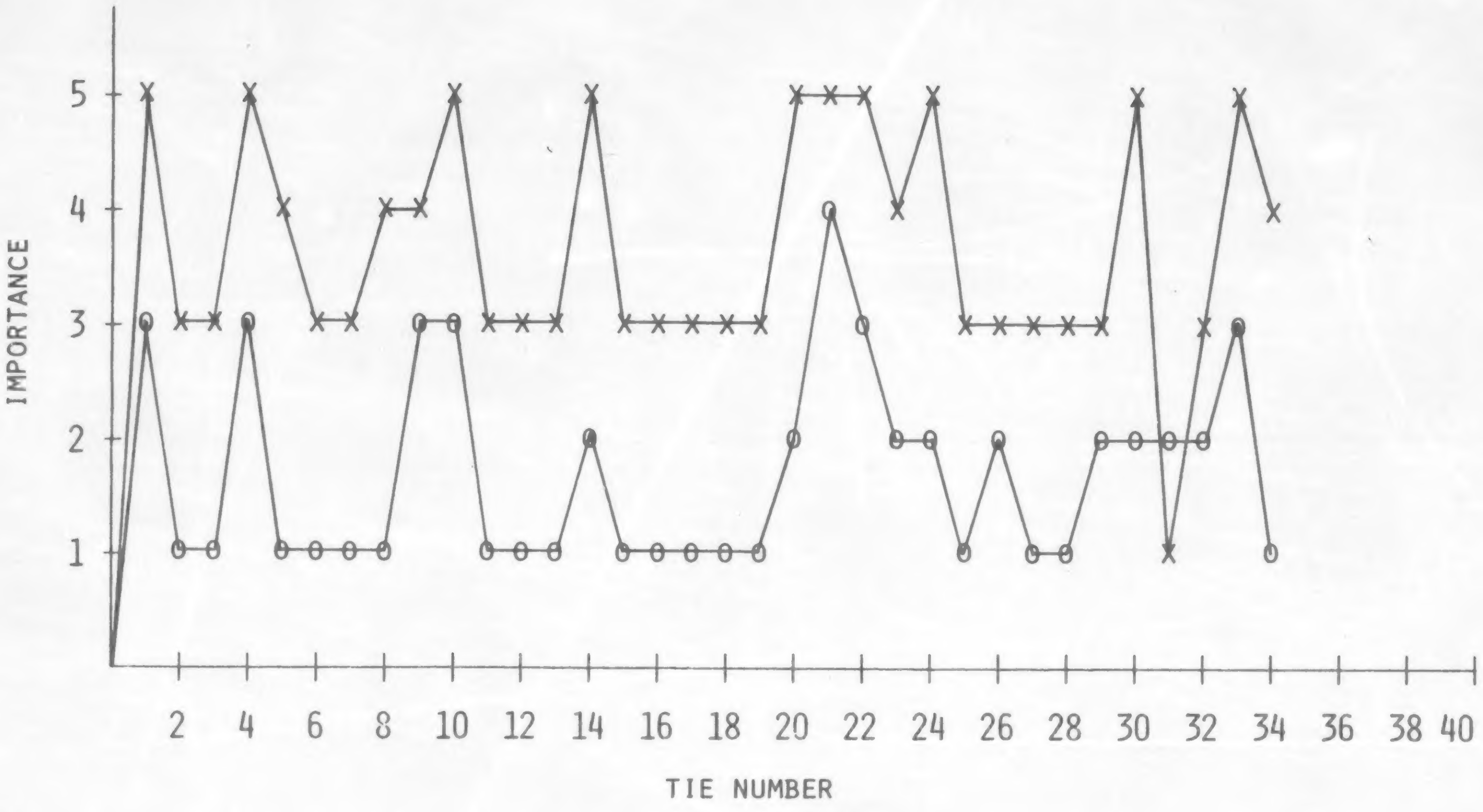
BY THE 1890'S THE WESTERN CATTLE INDUSTRY . . .



BY THE 1890'S THE WESTERN CATTLE INDUSTRY . . .

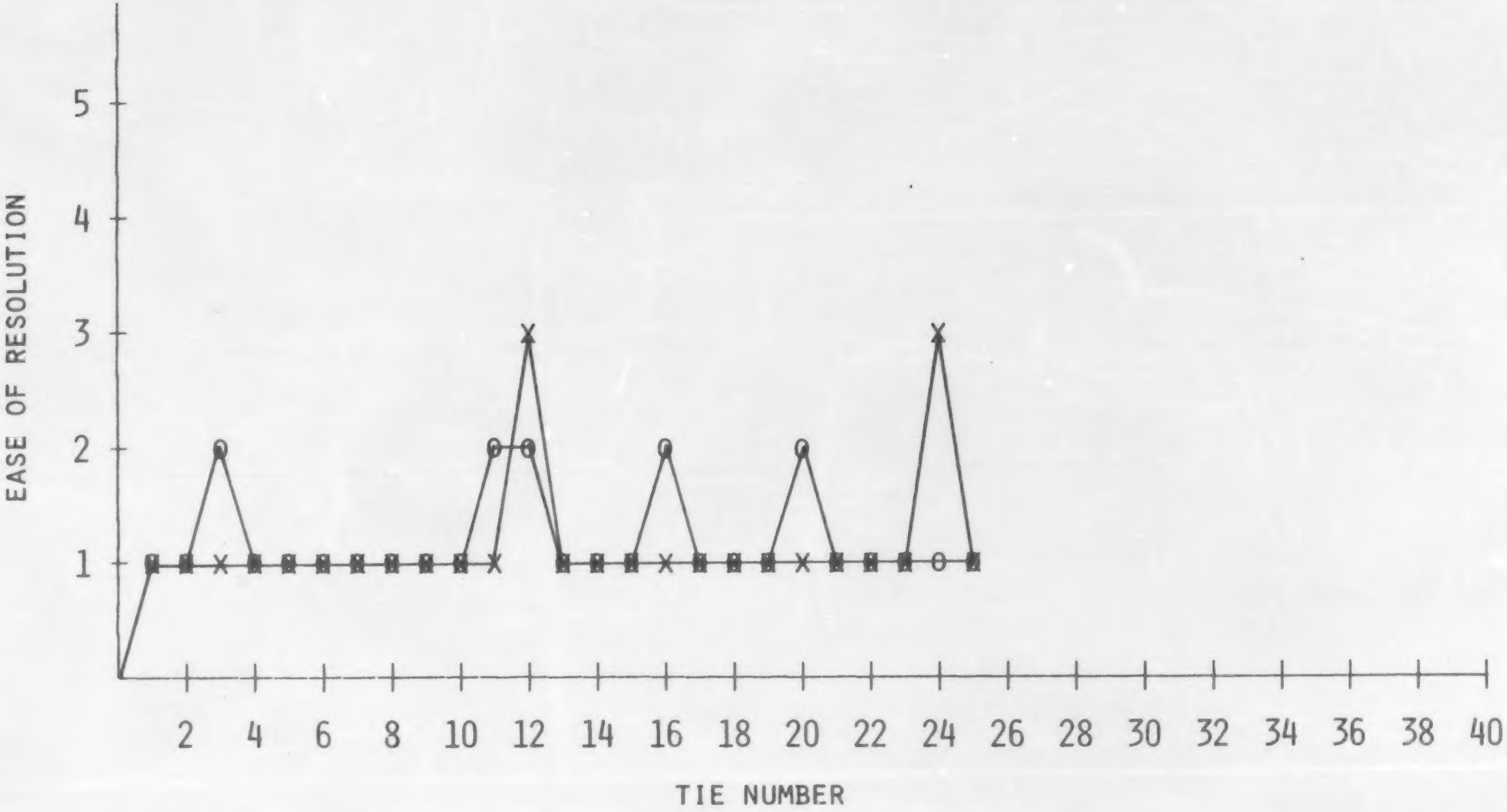


REPRODUCTION IN FISHES

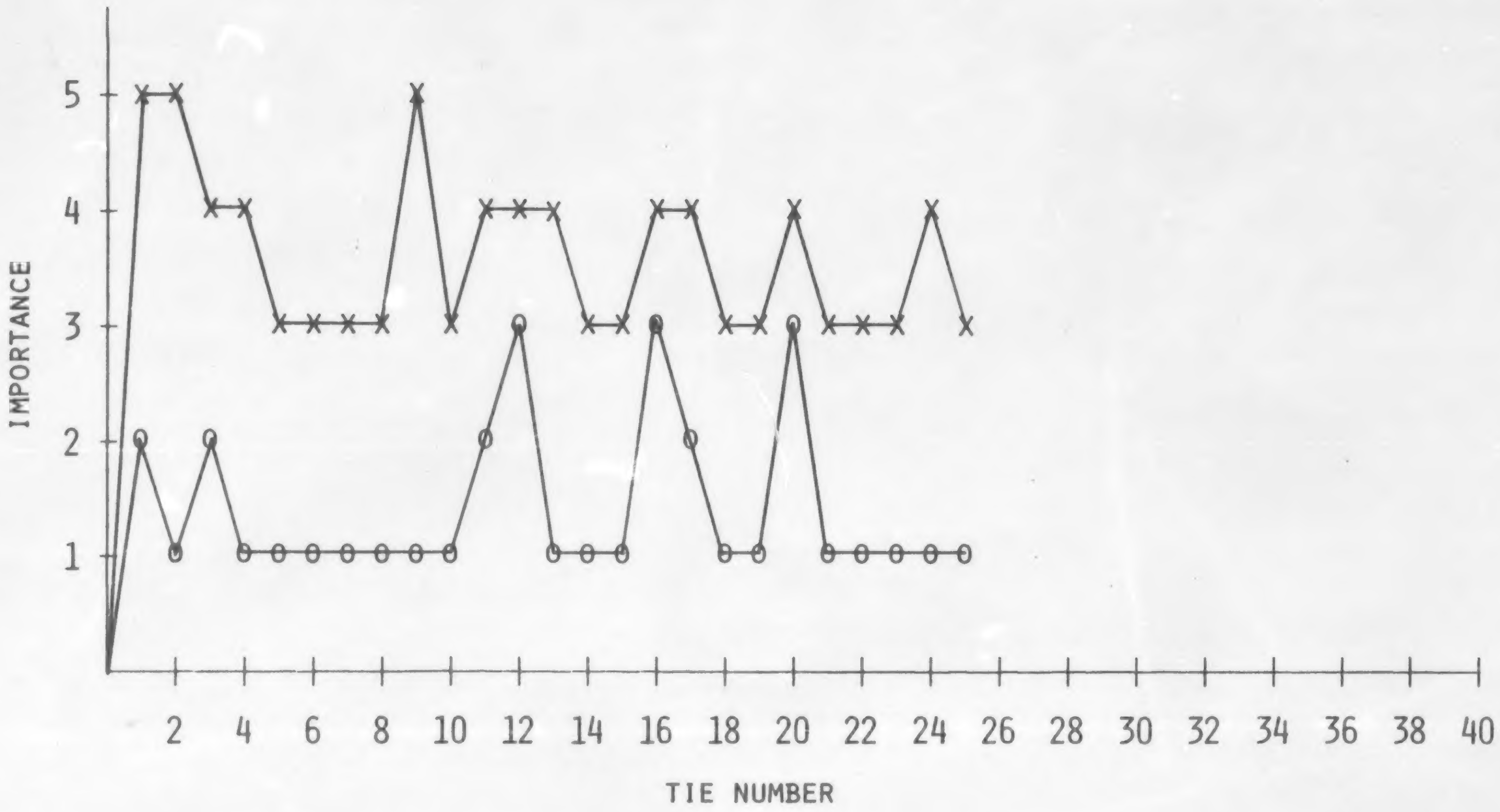


REPRODUCTION IN FISHES

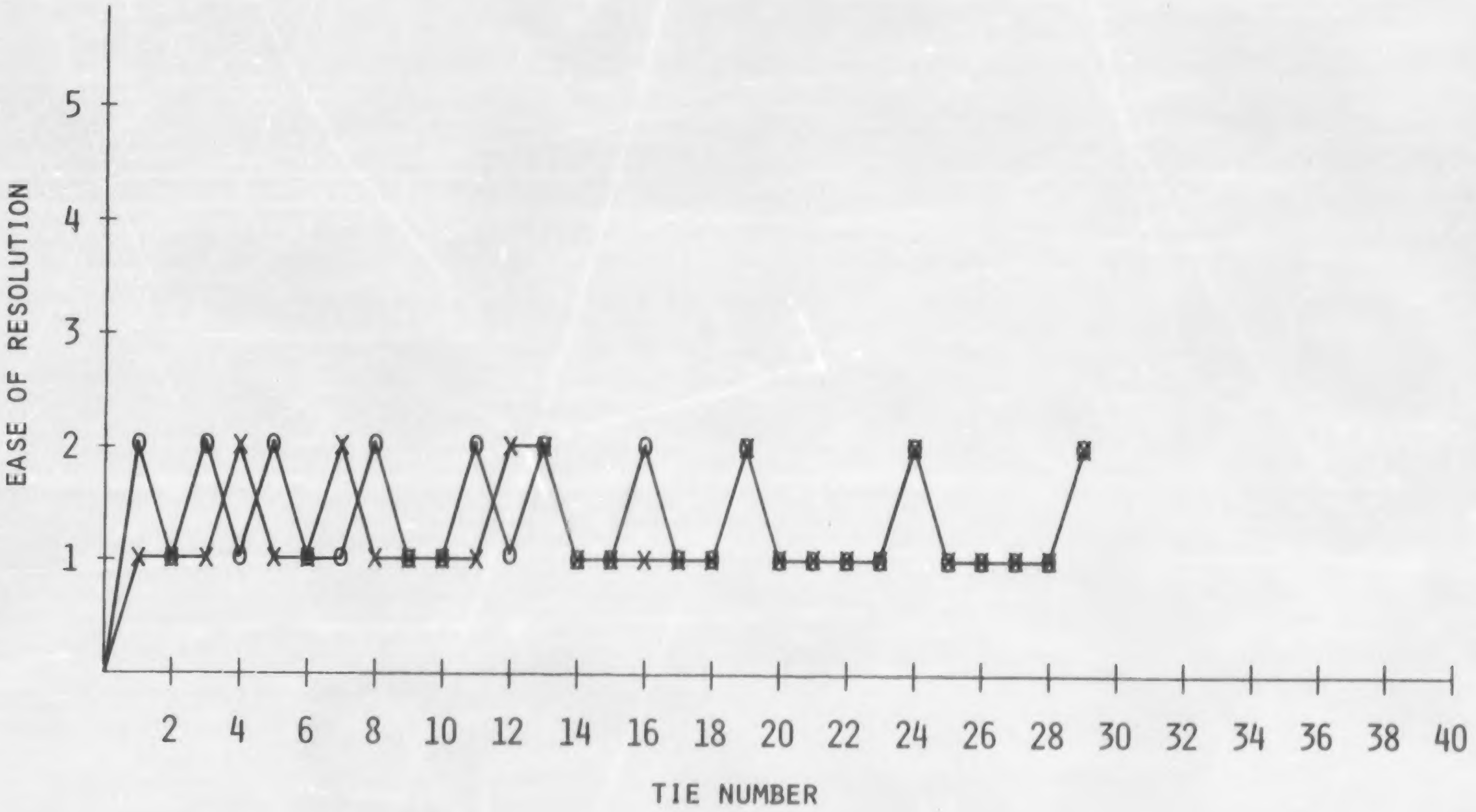
645



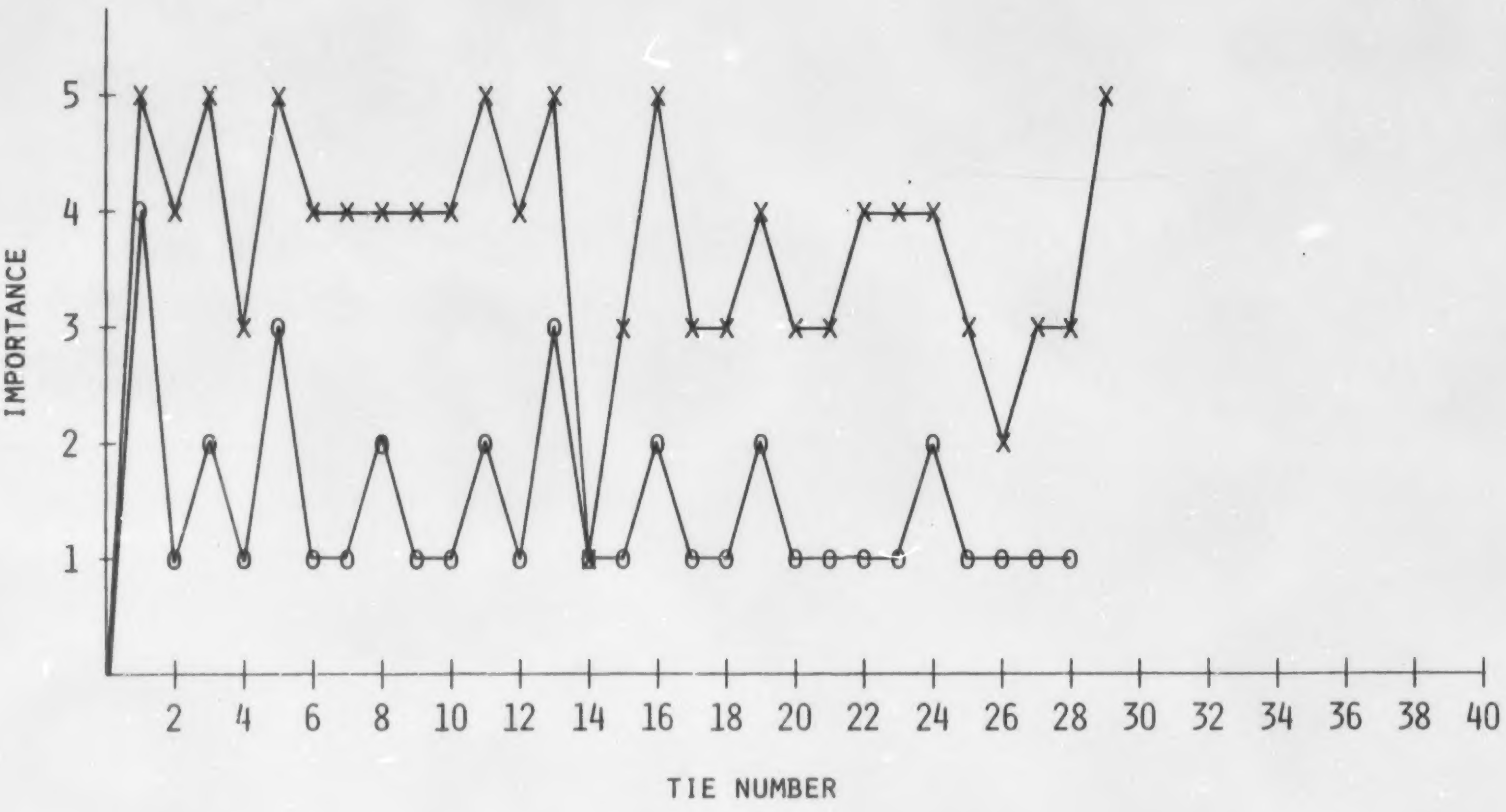
THE CHANGE TO AN ADULT FROG IS AMAZING



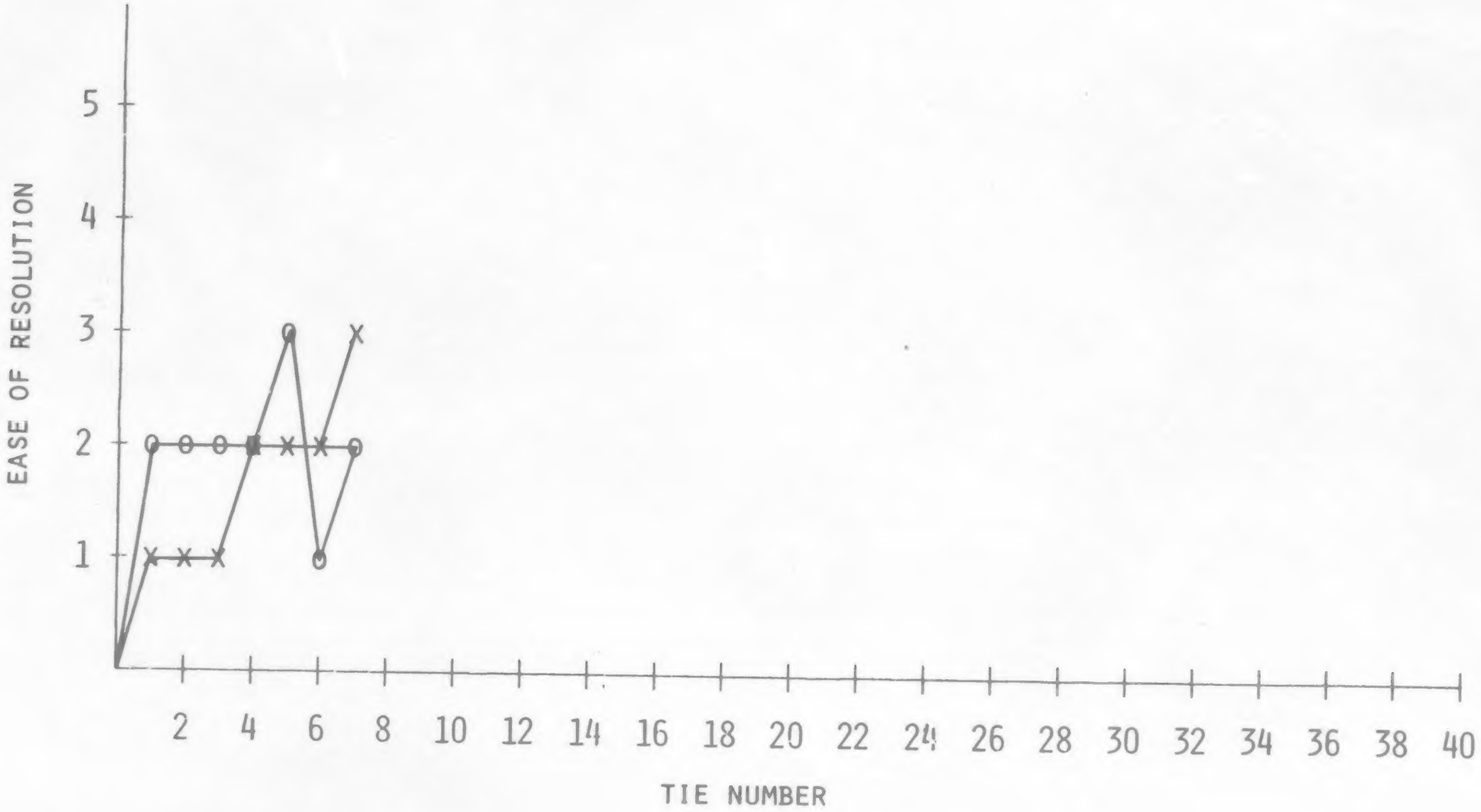
THE CHANGE TO AN ADULT FROG IS AMAZING



MUSCLE STRUCTURE



MUSCLE STRUCTURE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4
3
2
1
2
4
6
8
10
12
14
16
18
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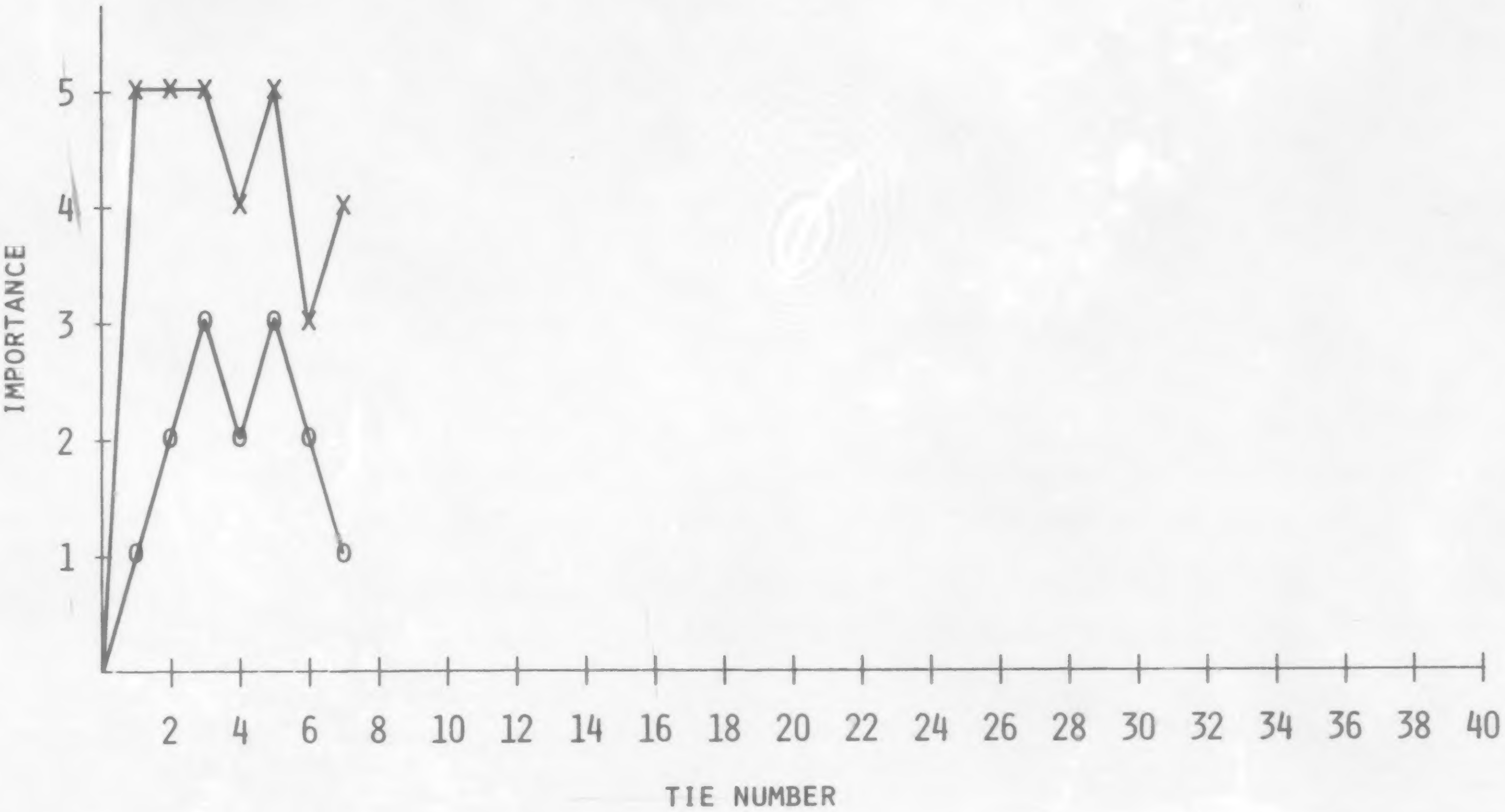
22
24
26
28
30
32
34
36
38
40
TIE NUMBER

ROCK BOTTOM


IMPORTANCE
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2
3
4
5
TIE NUMBER
2
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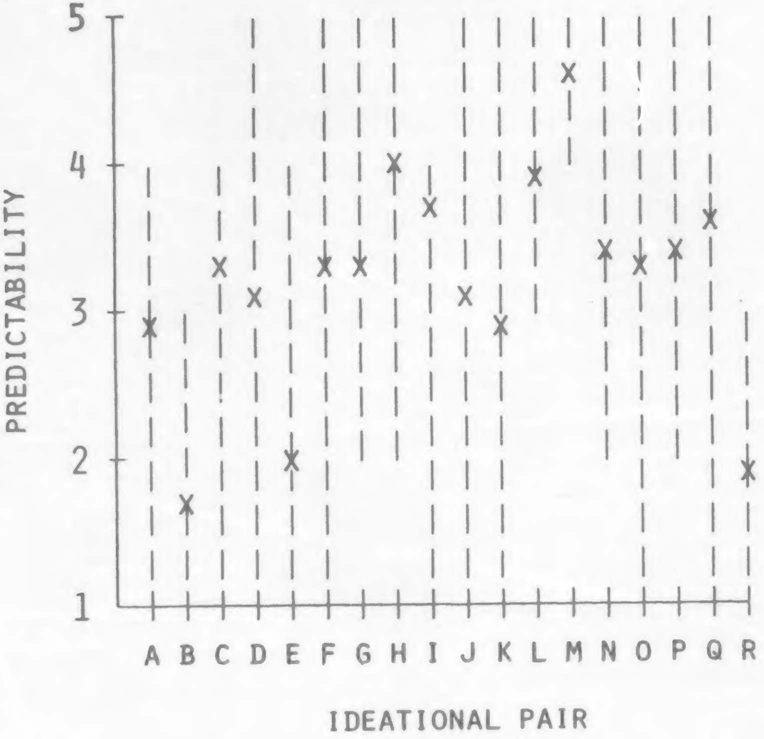
40

ROCK BOTTOM

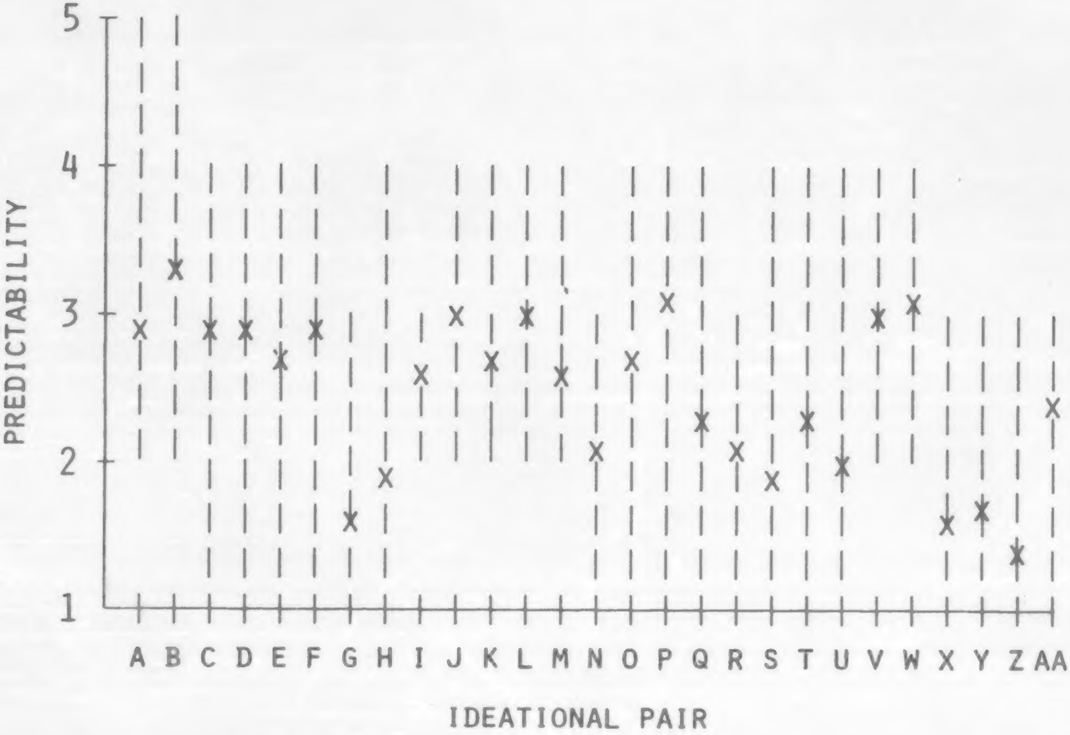
Appendix H

Graphs of Predictability Ratings of Topic Continuity

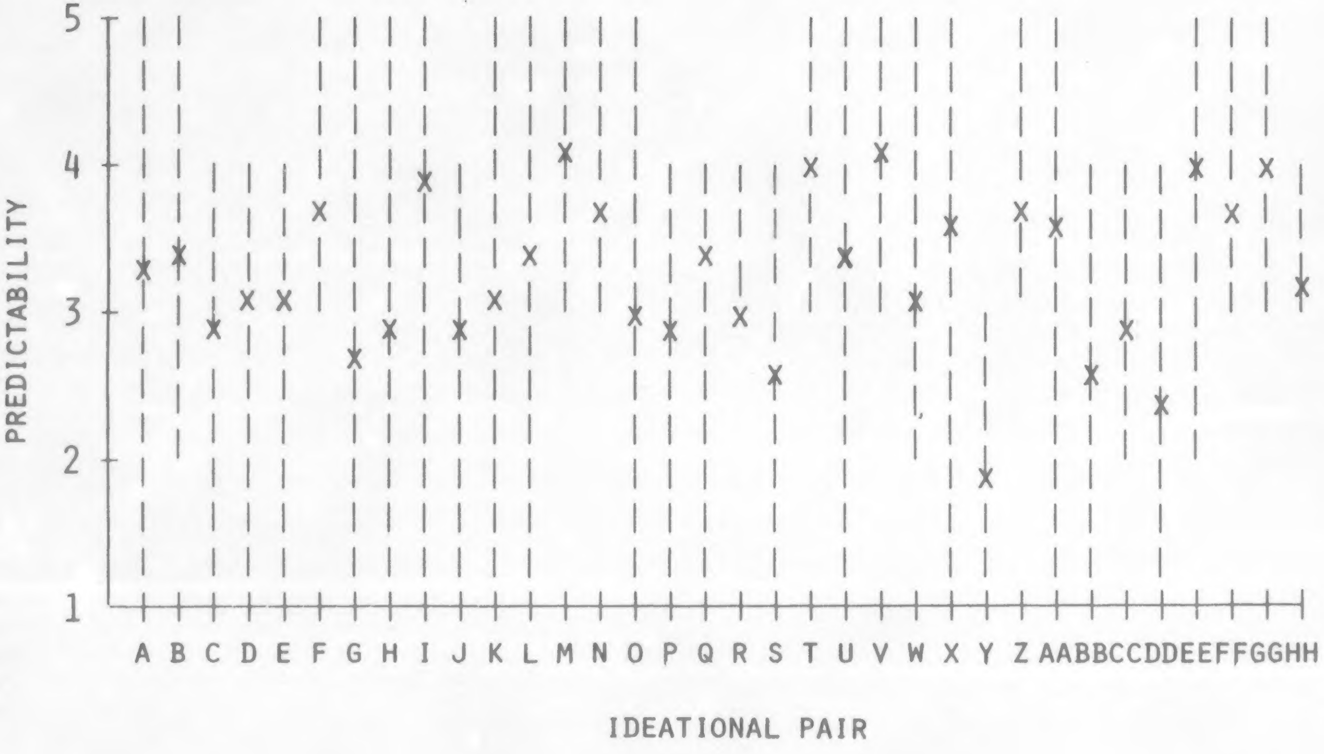
(refer to Section III, Part 4)



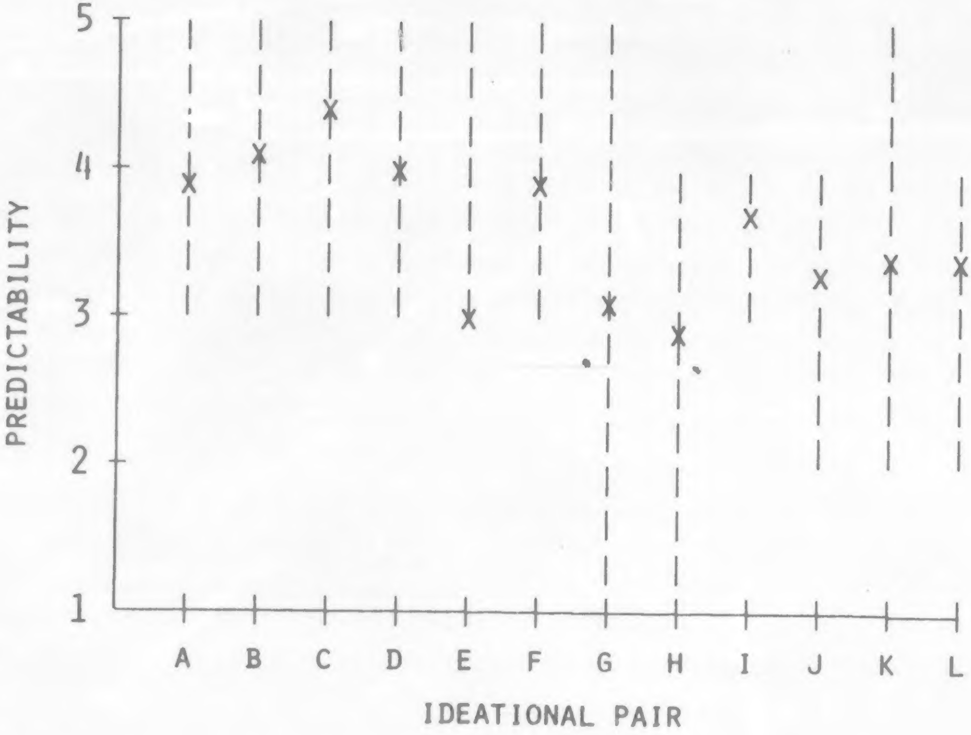
MUSCLE STRUCTURE



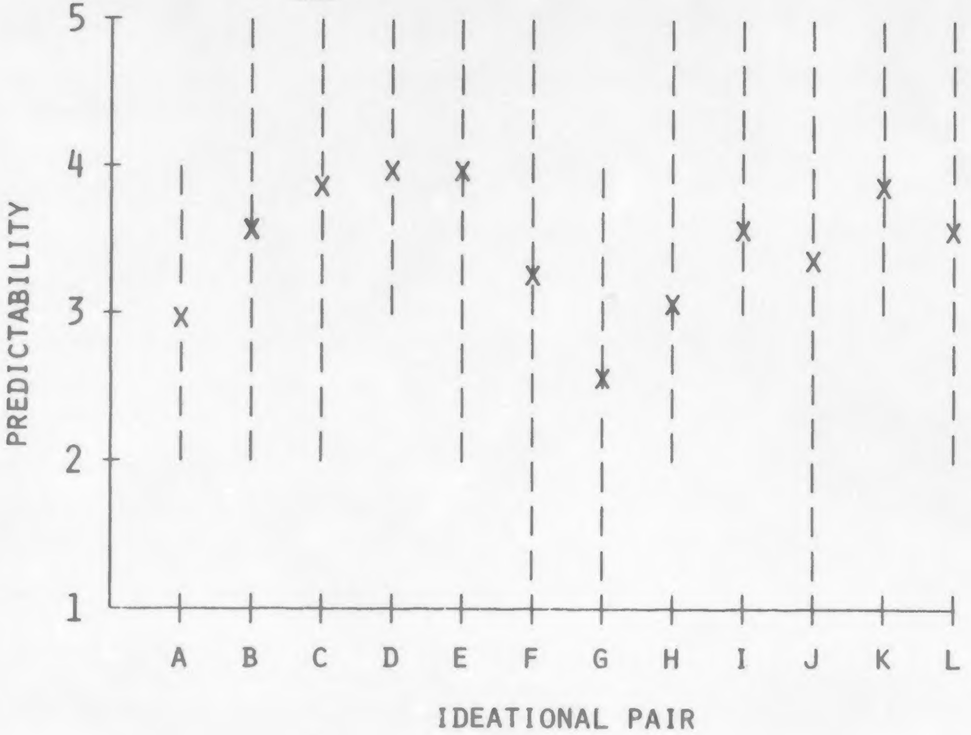
CHANGE TO ADULT FROG



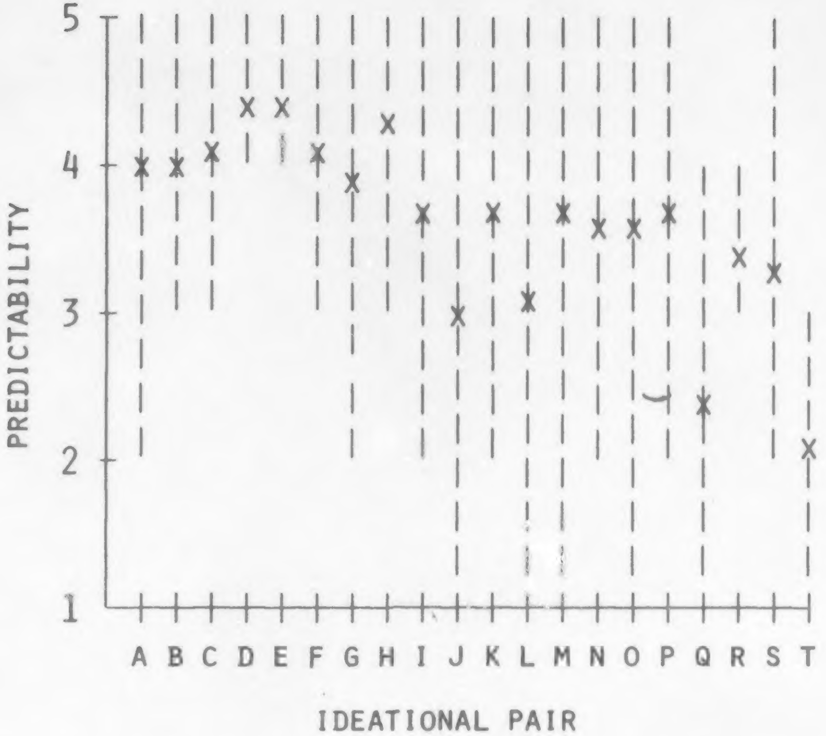
REPRODUCTION IN FISHES



PRESIDENT ROOSEVELT TOOK OFFICE . . .



RANCHES AND FENCES


5
4
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PREDICTABILITY
A
B
C
D
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F
G
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L
M
N
O
P
Q
R
S
T
IDEATIONAL PAIR

ROCK BOTTOM

Appendix I

Importance Rating Sentences

THE STRUCTURES OF THE SNAKE'S HEAD

#103-S

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	quite unimportant	somewhat unimportant	somewhat important	quite important	extremely important

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp. 1	2	3	4	5	extr. imp. 6
2	2	1.	Snakes have teeth on the lower jaw.	1	2	3	4	5	6
2	1	2.	The snake's prey is swallowed whole.	1	2	3	4	5	6
1	1	3.	The nasal cavities contain olfactory nerve endings.	1	2	3	4	5	6
1	2	4.	The nasal cavity is the location for the sense of smell.	1	2	3	4	5	6
2	1	5.	The tongue rests in a sheath on the floor of the mouth.	1	2	3	4	5	6
2	2	6.	Dust and odor-bearing particles from the air are picked up before being transfered to the Jacobson's organs.	1	2	3	4	5	6
2	1	7.	Tiny pits in front of the roof of the mouth are called Jacobson's organs.	1	2	3	4	5	6
1	2	8.	An example of a structure of the snake's head are its eyes.	1	2	3	4	5	6
1	1	9.	Each eye of the snake is covered by a transparent scale.	1	2	3	4	5	6
2	2	10.	Pupils are shaped differently in different snakes; for example, they can be round.	1	2	3	4	5	6
1	1	11.	The ears are embedded in the skull.	1	2	3	4	5	6
1	2	12.	The ears have no external openings.	1	2	3	4	5	6

THE REPRODUCTIVE SYSTEM OF THE FROG #104-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp.					extr. imp.
1	1	1.	The sex organs of both sexes are internal.	1	2	3	4	5	6
2	1	2.	The thumbs of the males are enlarged only during the breeding season.	1	2	3	4	5	6
1	2	3.	The male reproductive organs are called the testes.	1	2	3	4	5	6
1	1	4.	The testes lie in the back in the anterior region of the kidneys.	1	2	3	4	5	6
2	2	5.	The sperms go into the kidneys before they are discharged.	1	2	3	4	5	6
2	1	6.	The enlargement at the base of each ureter is called a seminal vesicle.	1	2	3	4	5	6
1	2	7.	The processes in the male reproductive system involve the sperm developing in the testes, then passing through the vasa efferentia into the kidneys, where they are discharged through the ureters into the cloaca.	1	2	3	4	5	6
1	1	8.	The ovaries are located above the kidneys.	1	2	3	4	5	6
1	2	9.	The female reproductive system is involved in a number of processes during the breeding season.	1	2	3	4	5	6
2	2	10.	The abdominal muscles work the eggs toward the anterior which is where they are gathered.	1	2	3	4	5	6
2	1	11.	The oviduct is lined with ciliated cells.	1	2	3	4	5	6
2	2	12.	The eggs go into the oviduct and then into the cloaca.	1	2	3	4	5	6

MUSCLE STRUCTURE #105-S

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp.					extr. imp.
1	2	1.	Muscle structure shows itself in striated muscles.	1	2	3	4	5	6
1	1	2.	Striated muscles are composed of muscle fibers.	1	2	3	4	5	6
1	1	3.	Muscle fibers are elongated cells.	1	2	3	4	5	6
1	2	4.	Striated muscles are crossed by striations.	1	2	3	4	5	6
2	2	5.	Seeing the bands under an ordinary light microscope is different from seeing them under an electron microscope.	1	2	3	4	5	6
2	2	6.	Seeing the bands as continuous from one side of the fiber to another is different from seeing them as features of the myofibrils.	1	2	3	4	5	6
2	2	7.	The bands that appear to be continuous from one side of the fiber to the other side are called A bands.	1	2	3	4	5	6
2	1	8.	The II bands are in the middle of the A bands.	1	2	3	4	5	6
2	1	9.	Myofibrils are very closely packed together.	1	2	3	4	5	6
2	1	10.	The banding is determined by the distribution of the materials composing it.	1	2	3	4	5	6
1	2	11.	Striated muscles are composed of sarcomeres.	1	2	3	4	5	6
1	1	12.	Sarcomeres is the term for the material between the two Z bands.						

HOW MUSCLES WORK #106-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp.					extr. imp.
1	1	1.	The action of muscles results from chemical processes within the individual cells.	1	2	3	4	5	6
1	1	2.	Muscular energy is transformed into mechanical energy in the form of motion.	1	2	3	4	5	6
1	2	3.	The way in which muscles are able to move bones illustrates a more general consideration of the relationship between the anatomical location of the muscle attachment and the action of some muscles.	1	2	3	4	5	6
1	1	4.	The anatomical location of the muscle attachments allows the muscles to be able to move the bones.	1	2	3	4	5	6
2	2	5.	One part of the muscle is the belly.	1	2	3	4	5	6
1	2	6.	The anatomical location of most muscle attachments is the periosteum of the bone.	1	2	3	4	5	6
2	2	7.	The most common attachment is by means of a tendon.	1	2	3	4	5	6
2	2	8.	A less common means of attachment is by a sheet of heavy connective tissue.	1	2	3	4	5	6
2	1	9.	The placements of the muscle origins bring about the movement of the forearm in a vertical plane.	1	2	3	4	5	6
1	2	10.	Knowing the origin and insertion of the triceps brachii allows us to understand the movement made possible by its action.	1	2	3	4	5	6
2	1	11.	The triceps have three origins which gives it its name.	1	2	3	4	5	6
2	1	12.	Since both the biceps and triceps have several points of attachment, complex action is possible.	1	2	3	4	5	6

SKELETAL MUSCLES WORK IN PAIRS #107-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp. 1	2	3	4	5	extr. imp. 6
1	1	1.	An important muscle characteristic is that skeletal muscles work in pairs.	1	2	3	4	5	6
1	2	2.	Skeletal muscles working in pairs, are antagonistic muscles that cause opposing actions.	1	2	3	4	5	6
1	1	3.	Antagonistic muscles cause opposing action.	1	2	3	4	5	6
2	1	4.	Each muscular contraction causes motion in one direction.	1	2	3	4	5	6
2	2	5.	When a muscular contraction causes motion in one direction, a muscle contraction of the other member of the pair causes motion in the opposite direction.	1	2	3	4	5	6
2	2	6.	The contraction of the biceps muscle is an example of the action of biceps and triceps.	1	2	3	4	5	6
2	1	7.	Contraction of the biceps muscle causes the arm to flex at the elbow.	1	2	3	4	5	6
1	1	8.	The mechanism by which contractions of antagonistic muscles are controlled by the central nervous system is not clearly understood.	1	2	3	4	5	6
1	2	9.	How contractions of antagonistic muscles are controlled by the central nervous system appears to be by a process in which the contraction of a muscle stimulates nerve cells which send a volley of nervous impulses.	1	2	3	4	5	6
2	1	10.	The volley of nervous impulses from nerve cells goes to the central nervous system.	1	2	3	4	5	6
2	2	11.	A property of the volley of nervous impulses is that it prevents the muscle from contracting rather than causing it to relax.	1	2	3	4	5	6

CLASS CHONDRICHTHYES
CARTILAGE FISHES

#110-S

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	quite unimportant	somewhat unimportant	somewhat important	quite important	extremely important

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp.					extr. imp.
1	1	1.	An example of the class, chondrichthyes, is sharks.	1	2	3	4	5	6
1	2	2.	Because sharks have certain differences, they are placed in a separate class.	1	2	3	4	5	6
2	1	3.	The long upper lobe causes the shark's head to go down.	1	2	3	4	5	6
1	2	4.	The shark's mouth is a horizontal slit.	1	2	3	4	5	6
1	1	5.	The jaws of most sharks are lined with teeth.	1	2	3	4	5	6
2	1	6.	When a shark loses a tooth, another moves forward to replace it.	1	2	3	4	5	6
2	2	7.	The shark is a fearsome hunter because its teeth slant backwards and thus can hold food securely in its mouth.	1	2	3	4	5	6
1	2	8.	The respiratory process of the shark involves water entering the mouth, passing the gills, before being forced out through separate pairs of gill slits.	1	2	3	4	5	6
2	1	9.	The shark's gills are located on either side of the head.	1	2	3	4	5	6
1	1	10.	Sharks have eyes.	1	2	3	4	5	6

STRUCTURES OF THE TRUNK AND TAIL #111-S

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp.					extr. imp.
1	2	1.	Fins are an example of structures of the trunk and tail.	1	2	3	4	5	6
1	1	2.	Fins differ in form from species to species.	1	2	3	4	5	6
2	1	3.	The spiny rays are composed of cartilage.	1	2	3	4	5	6
2	1	4.	The sharp spines that are raised toward the head make it hard for the fish to be swallowed tail first.	1	2	3	4	5	6
1	1	5.	One example of a single fin is the anal fin.	1	2	3	4	5	6
2	2	6.	The anterior dorsal fin of the perch exemplifies anterior dorsal fins in fish.	1	2	3	4	5	6
2	1	7.	The anterior dorsal fin of the perch contains sharp spines.	1	2	3	4	5	6
2	2	8.	Because the sharp spines are raised toward the head making the fish hard to be swallowed tail first, they act as a defense against attack.	1	2	3	4	5	6
1	2	9.	An example of muscles in the trunk and tail can be found in the region of the trunk above the spinal column.	1	2	3	4	5	6
1	2	10.	One example of the structures of the lateral line under the scales is the nerve endings.	1	2	3	4	5	6
1	1	11.	The lateral line acts as a sense organ.	1	2	3	4	5	6

FLAGELLATES #114-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp. 1	2	3	4	5	extr. imp. 6
1	1	1.	Flagellates have long been a biological battleground.	1	2	3	4	5	6
1	2	2.	We recognize that some flagellates are indeed plants.	1	2	3	4	5	6
1	1	3.	Euglena are related to green algae.	1	2	3	4	5	6
2	2	4.	Green algae store starch.	1	2	3	4	5	6
2	1	5.	When Euglena is kept in the dark or treated with streptomycin, it loses chlorophyll.	1	2	3	4	5	6
1	2	6.	Still other flagellates seem to belong to both kingdoms, as for example the Khawkinia.	1	2	3	4	5	6
2	1	7.	The Chilomonas consumes its prey whole as all animals do.	1	2	3	4	5	6
1	2	8.	That some flagellates seem to belong to both kingdoms leads to considering them as a welter of varied flagellates.	1	2	3	4	5	6
1	1	9.	Biologists disagree as to where they should draw the line between plants and animals.	1	2	3	4	5	6
2	2	10.	An example of the relationship shown by these resemblances is that some flagellates are similar to the ameba.	1	2	3	4	5	6
2	2	11.	When they lose their flagella, some flagellates move by means of flowing protoplasm.	1	2	3	4	5	6
2	1	12.	The protospongia is similar to the collar cells of sponges.	1	2	3	4	5	6

THE LINNAEAN SYSTEM #115-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	quite unimportant	somewhat unimportant	somewhat important	quite important	extremely important

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp.					extr. imp.
1	1	1.	The Linnaean System uses binomial classification.	1	2	3	4	5	6
1	2	2.	The binomial classification system involves rules for naming new species.	1	2	3	4	5	6
2	2	3.	An example of the two things that a scientist must do when he first identifies a new species is to publish a description of it in a recognized journal.	1	2	3	4	5	6
2	1	4.	The scientist must deposit an original specimen in some collection where others can study it.	1	2	3	4	5	6
1	1	5.	We still use the basic system but we look at it differently.	1	2	3	4	5	6
2	2	6.	Species that become extinct are different from species that change into one or more new species.	1	2	3	4	5	6
2	1	7.	Because the change in species is gradual, it is hard to decide when the species have drifted far enough apart to be called separate species.	1	2	3	4	5	6
2	1	8.	Whether organisms still belong together is an example of an issue that biologists often disagree about.	1	2	3	4	5	6
2	2	9.	Groups of organisms that have drifted far enough apart to be called separate species are different from those that still belong together.	1	2	3	4	5	6
1	2	10.	An example of Linnaeus' use of his own system is that he regarded species as fixed and unchanging.	1	2	3	4	5	6
1	2	11.	That a species is a population which always shares considerable natural variance is an example of how we view the basic system.	1	2	3	4	5	6
1	1	12.	A species was represented by the type of speciman deposited in a museum and variations from the type were regarded almost as nuisances.	1	2	3	4	5	6

CHIEF ARGUMENTS FOR AND AGAINST SLAVERY #217-S

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)				extr. unimp.					extr. imp.
1	1		1.	The chief arguments for and against slavery did not change much for 100 years.	1	2	3	4	5	6
1	2		2.	The arguments for slavery were presented by Malachy Postlethwayt.	1	2	3	4	5	6
1	2		3.	An example of an argument for slavery is that slaves made money for slaveowners.	1	2	3	4	5	6
1	2		4.	An example of arguments against slavery was that it was evil to make money from slaves.	1	2	3	4	5	6
1	1		5.	Slaves were property and property could not be taken away.	1	2	3	4	5	6
2	2	*	6.	To say that no human being could be property is similar to saying that no man has the right to own another man.	1	2	3	4	5	6
2	2		7.	That it was wrong to say that a slave was just another kind of property illustrates the belief that no human being could be property, no man has the right to own another man.	1	2	3	4	5	6
2	2		8.	Slaves still had the right to freedom, as do all men and it mattered little how well a master treated his slave.	1	2	3	4	5	6
1	1		9.	The slaves had a right to freedom as do all men.	1	2	3	4	5	6
2	1	*	10.	To say that the slaves were better off than they had been in Africa is different from saying that slaves still had a right to freedom as do all men.	1	2	3	4	5	6
2	1		11.	The souls of the black men, women and children would be saved no matter what happened to their bodies on earth.	1	2	3	4	5	6
2	1		12.	The argument of converting slaves to Christianity was very different from the argument that it was nonsense to say we were helping the slaves by making them Christians.	1	2	3	4	5	6

WHY BLACKS HAD LITTLE HOPE IN 1857 #218-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp.					extr. imp.
1	2	1.	An example of why blacks had little hope in 1857 was their life in the North.	1	2	3	4	5	6
1	2	2.	In the North most white people could not forget that each freedman had once been a slave	1	2	3	4	5	6
2	2	3.	An example of the little equality available in the North is that there were few places where black men could hope to vote.	1	2	3	4	5	6
2	2	4.	Another example of little equality is that there were few places where a black man could hope to find a good job.	1	2	3	4	5	6
1	1	5.	In the South, slavery was stronger than ever.	1	2	3	4	5	6
1	1	6.	In the growing United States, new states were forming.	1	2	3	4	5	6
2	1	7.	There were few places where a black man could hope to give his children an education equal to that of white children.	1	2	3	4	5	6
1	2	8.	The growing United States allowed for the spread of slavery.	1	2	3	4	5	6
2	2	9.	An example of a Northern politician is Stephen Douglas.	1	2	3	4	5	6
2	1	10.	Stephen Douglas was a senator from Illinois.	1	2	3	4	5	6
2	1	11.	Stephen Douglas said that slavery should be allowed in any new state where white citizens wanted it.	1	2	3	4	5	6
1	1	12.	The Dred Scott decision would lead to a decision about many other questions.	1	2	3	4	5	6

WESTERN CATTLE INDUSTRY IN 1890'S #219-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)		extr. unimp.					extr. imp.
1	1	1. The western cattle industry centered in the high plains by the 1890's.	1	2	3	4	5	6
1	1	2. Most ranchers by now owned their grazing land and fenced it with barbed wire.	1	2	3	4	5	6
1	1	3. The size of a grazing area depends upon the amount of rain.	1	2	3	4	5	6
2	2	4. Western ranches seemed enormous to easteners, who by contrast were accustomed to small farms.	1	2	3	4	5	6
2	1	5. Easterners were accustomed to small farms of not more than a few hundred acres.	1	2	3	4	5	6
1	2	6. The western cattle industry of 1890 was influenced by the availability of water.	1	2	3	4	5	6
2	2	7. Because of the improvement of windmills for pumping water, many cattle raisers watered their stock from wells.	1	2	3	4	5	6
1	2	8. The years of abundant rainfall caused grass to grow.	1	2	3	4	5	6
2	1	9. Fattened herds caused the rancher to prosper.	1	2	3	4	5	6
1	2	10. An example of the influence of the availability of water is that years of drought would cause no natural grasses to grow, which in turn would force the ranchers to feed cattle hay or cottonseed cake, thus wiping out their profits.	1	2	3	4	5	6
2	2	11. The absense of natural grasses forced the ranchers to feed cattle hay or cotton seed cake.	1	2	3	4	5	6
2	1	12. Feeding cattle hay and cotton seed cake was a costly practice.	1	2	3	4	5	6

THE SHERMAN ANTITRUST ACT #220-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp. 1	2	3	4	5	extr. imp. 6
1	1	1.	The Sherman antitrust act finally passed in 1890.	1	2	3	4	5	6
1	2	2.	What the public assumed the act would do was to break up giant trusts and thereby restore a larger measure of free competition.	1	2	3	4	5	6
1	1	3.	The term trust had come to mean a monopoly or near monopoly of the business.	1	2	3	4	5	6
1	1	4.	What public assumed the act was about was similar to what congress intended.	1	2	3	4	5	6
1	2	5.	An example of the weaknesses of the act is that few Americans understood precisely what the new law did and did not prohibit.	1	2	3	4	5	6
1	2	6.	An example of the weaknesses of the act is that it was extremely difficult to enforce.	1	2	3	4	5	6
2	1	7.	The government lost 7 out of the first 8 cases.	1	2	3	4	5	6
2	2	8.	That the goverment lost 7 out of the first 8 cases illustrates that the act was extremely diffucult to enforce.	1	2	3	4	5	6
2	2	9.	The act being extremely difficult to enforce, led to a Supreme Court decision.	1	2	3	4	5	6
2	1	10.	The Supreme Court decided the company's control over refining didn't restrain interstate trade and therefore found the company not guilty.	1	2	3	4	5	6
2	2	11.	A monopoly itself was not illegal but it was illegal only when it restrained interstate trade.	1	2	3	4	5	6
2	1	12.	The Supreme Court decision was that monopolies are illegal only when they restrain interstate trade.	1	2	3	4	5	6

JOHN D. ROCKEFELLER #222-S

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp. 1	2	3	4	5	extr. imp. 6
1	1	1.	Even richer than Carnegie was John D. Rockefeller	1	2	3	4	5	6
1	2	2.	Rockefeller started life as a poor boy and later accumulated the worlds greatest fortune.	1	2	3	4	5	6
2	2	3.	Rockefeller worked as a clerk before 1958.	1	2	3	4	5	6
2	1	4.	In 1895 Rockefeller was 19 years old.	1	2	3	4	5	6
2	2	5.	After 1958 the civil war brought large profits to the business.	1	2	3	4	5	6
2	2	6.	Before Rockefeller invested in oil refineries the civil war brought large profits to his business.	1	2	3	4	5	6
1	2	7.	He brought order and efficiency to the oil industry, his major interest.	1	2	3	4	5	6
1	1	8.	Oil became his major interest before 1900.	1	2	3	4	5	6
2	1	9.	He sold the Great Lake Steamers to U. S. Steel Corporation.	1	2	3	4	5	6
1	2	10.	An example that his interests had broadened is that he owned controlling stock in iron ore.	1	2	3	4	5	6
2	1	11.	The United States Steel Corporation was being organized by J. P. Morgan.	1	2	3	4	5	6
1	1	12.	Like Carnegie Rockefeller later gave away many millions.	1	2	3	4	5	6

THE NEW DEAL FARM PROGRAM #223-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)		**extr. unimp.** 1	2	3	4	5	**extr. imp.** 6
1	1	1. A disaster struck the Great Plains.	1	2	3	4	5	6
1	2	2. Farm practices lead to the disaster.	1	2	3	4	5	6
1	2	3. When high prices tempted farmers to grow wheat and cotton, plows and harrows broke up the sod.	1	2	3	4	5	6
2	2	4. Because the years were unusually dry, there was a danger that the region would become a desert.	1	2	3	4	5	6
2	1	5. It was terrible that dust storms carried away toosoil.	1	2	3	4	5	6
2	1	6. The sun was obscured by a yellow haze.	1	2	3	4	5	6
2	2	7. After unusually dry years, the water table sank causing deep wells to run dry.	1	2	3	4	5	6
1	1	8. It was estimated that 350,000 farmers emigrated from the dust bowl between 1934 and 1939.	1	2	3	4	5	6
2	2	9. Department of Agriculture helped farmers plant trees in order to cut wind velocity.	1	2	3	4	5	6
1	1	10. The New Deal farm program suffered much criticism.	1	2	3	4	5	6
1	2	11. A criticism of the New Deal farm program was that benefits of the AAA were unequal.	1	2	3	4	5	6
2	1	12. Hundreds of thousands of families were saved from bleak despair and poverty.	1	2	3	4	5	6

DUST BOWL

#223-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)		extr. unimp.					extr. imp.
1	1	1. A disaster struck the Great Plains.	1	2	3	4	5	6
1	2	2. Farm practices lead to the disaster.	1	2	3	4	5	6
1	2	3. When high prices tempted farmers to grow wheat and cotton, plows and harrows broke up the sod.	1	2	3	4	5	6
2	2	4. Because the years were unusually dry, there was a danger that the region would become a desert.	1	2	3	4	5	6
2	1	5. It was terrible that dust storms carried away topsoil.	1	2	3	4	5	6
2	1	6. The sun was obscured by a yellow haze.	1	2	3	4	5	6
2	2	7. After unusually dry years, the water table sank causing deep wells to run dry.	1	2	3	4	5	6
1	1	8. It was estimated 350,000 farmers emigrated from the dust blow between 1934 and 1939.	1	2	3	4	5	6
2	2	9. Department of Agriculture helped farmers plant trees in order to cut wind velocity.	1	2	3	4	5	6
1	1	10. The New Deal farm program suffered much criticism.	1	2	3	4	5	6
1	2	11. A criticism of the New Deal farm program was that benefits of the AAA were unequal.	1	2	3	4	5	6
2	1	12. Hundreds of thousands of families were saved from bleak despair and poverty.	1	2	3	4	5	6

THE FIRST PHASE OF THE NEW DEAL #225-S

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp. 1	2	3	4	5	extr. imp. 6
1	2	1.	During the first phase of the New Deal, Roosevelt had no very clear idea of how to deal with economic crisis.	1	2	3	4	5	6
1	1	2.	Roosevelt was not dismayed that he had no very clear idea of how to deal with economic crisis.	1	2	3	4	5	6
2	2	3.	He signed some laws in order to avoid holding up legislation.	1	2	3	4	5	6
2	1	4.	His philosophy was "try something".	1	2	3	4	5	6
2	2	5.	He felt action was better than inaction; for example, he saw himself as a quarterback on a football team.	1	2	3	4	5	6
1	2	6.	The New Deal was not a carefully worked out program because Roosevelt did not have a clear idea of how to deal with economic crisis.	1	2	3	4	5	6
1	1	7.	Unlike other carefully worked out programs, the New Deal was not carefully worked out.	1	2	3	4	5	6
2	1	8.	Alexander Hamilton's program was proposed during the Washington Administration.	1	2	3	4	5	6
1	1	9.	An example of a carefully worked out program was that of Woodrow Wilson.	1	2	3	4	5	6
1	2	10.	The New Deal had some measures embodying long-standing demands for change that would have been enacted sooner or later.	1	2	3	4	5	6
2	2	11.	Congress repealed the Volstead Act before passing the Twenty-First Amendment.	1	2	3	4	5	6
2	1	12.	The Twenty-First Amendment repealed the prohibition amendment once and for all.	1	2	3	4	5	6

THE AMERICAN ECONOMY WAS CLOSE TO ROCK BOTTOM #226-S

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp. 1	2	3	4	5	extr. imp. 6
1	2	1.	The American economy was close to rock bottom as exemplified by conditions in every large city.						
1	1	2.	A song, "Brother can you spare me a dime", reflected the frequency of begging.	1	2	3	4	5	6
1	2	3.	Dwindling tax receipts caused local government to go near bankruptcy.	1	2	3	4	5	6
2	2	4.	Firefighters were among those employees not paid for months at a time.	1	2	3	4	5	6
1	1	5.	The depression had its harshest effects on those who could least bear it.	1	2	3	4	5	6
2	1	6.	Farmers' income fell more rapidly.	1	2	3	4	5	6
2	2	7.	An example of people who could bear the depression better were owners of stocks and bonds.	1	2	3	4	5	6
2	2	8.	People with fixed incomes, for instance, could bear the depression better.	1	2	3	4	5	6
2	1	9.	Among those who had fixed incomes were college professors.	1	2	3	4	5	6
2	1	10.	For those with fixed incomes, the fact that prices dropped actually caused them to be better off.	1	2	3	4	5	6
1	1	11.	The bottom dropped out on the new car market, but enough people managed to hold onto old ones.	1	2	3	4	5	6
1	2	12.	An example of the depression being uneven in its impact was the fact that cigarette sales rose steadily.	1	2	3	4	5	6

EFFECTS ON MILLIONS OF YOUNG AMERICANS #227-S

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	**quite unimportant**	**somewhat unimportant**	**somewhat important**	**quite important**	**extremely important**

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp. 1	2	3	4	5	extr. imp. 6
1	2	1.	An effect of the Depression on millions of young Americans was the lack of clothing.	1	2	3	4	5	6
1	2	2.	During the Depression, the youth faced unemployment after graduating from school.	1	2	3	4	5	6
1	1	3.	Two agencies were created that brought immediate relief to the nation's youth.	1	2	3	4	5	6
1	1	4.	One of the New Deal work relief measures was the Civilian Conservation Corps.	1	2	3	4	5	6
2	1	5.	Work camps were scattered across the country.	1	2	3	4	5	6
2	1	6.	Young men were expected to share the wages that they were paid with their families.	1	2	3	4	5	6
2	2	7.	Helping to conserve the nation's natural resources was socially useful work.	1	2	3	4	5	6
2	2	8.	One way that young men helped to conserve the nation's natural resources was by clearing swamps.	1	2	3	4	5	6
2	1	9.	Young men cleared land for public parks.	1	2	3	4	5	6
1	1	10.	The NYA distributed Federal money to needy students.	1	2	3	4	5	6
2	2	11.	Youth performed tasks in and around their schools before being paid regular wages.	1	2	3	4	5	6
1	2	12.	The New Deal work relief measures saved hundreds of thousands of youths from idleness.	1	2	3	4	5	6

ROOSEVELT'S FINANCIAL POLICIES #229-U

Rate the importance of the idea(s) represented in the following sentences to the whole passage.

The rating is on a 6-point scale:

1	2	3	4	5	6
extremely unimportant	quite unimportant	somewhat unimportant	somewhat important	quite important	extremely important

Circle the number which represents your rating.

level (1= high; 2= low)	explicitness (1=exp.; 2=imp.)			extr. unimp. 1	2	3	4	5	extr. imp. 6
1	2	1.	Roosevelt's financial policies were part of the New Deal.	1	2	3	4	5	6
2	2	2.	Roosevelt's opposition became more outspoken after the return of better times,	1	2	3	4	5	6
1	1	3.	Three methods were used to finance programs.	1	2	3	4	5	6
1	2	4.	One of the inflation measures was Congress authorizing FDR to print paper money.	1	2	3	4	5	6
1	1	5.	Deficit spending is defined as the government spending more than it receives in taxes.	1	2	3	4	5	6
1	2	6.	Deficit spending increased the national debt.	1	2	3	4	5	6
2	1	7.	Business leaders in particular lost confidence in the administration because it piled up a larger national debt.	1	2	3	4	5	6
1	1	8.	Raising taxes was another method used by the New Deal to finance operations.	1	2	3	4	5	6
2	2	9.	Critics calling the Revenue Act of 1935 a "soak the rich proposal" preceded its passing by Congress.	1	2	3	4	5	6
2	1	10.	Congress passed the Revenue Act of 1935 which was often called the Wealth Tax Act.	1	2	3	4	5	6
2	2	11.	Not balancing the budget caused the national debt to continue to grow.	1	2	3	4	5	6
2	1	12.	The taxes obtained revenue but this did not balance the budget.	1	2	3	4	5	6